

Web News Browser using Map Interface for NIE Programs in Elementary Schools in Japan

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ABSTRACT

In many elementary schools around the world, NIE (Newspaper In Education) programs that use newspapers as study materials have been implemented. However, the contents of newspaper articles are difficult for elementary school children. It is also not easy for children to find interesting articles in the newspapers. In this study, we propose a system to browse Web news using a map interface, in order to provide support for NIE programs in elementary schools in Japan. Children can find, confirm and learn various events which occurred near their own town by using the proposed system. Therefore, NIE programs using both our system and printed newspaper will open a new road of NIE programs. This paper proposes an interface based on maps and support functions of our browsing system, and discusses results of preliminary evaluations of our system. Finally, we improve a method to extract locations from articles and a part of the interface of the proposed system based on the evaluation results.

KEYWORDS

NIE (Newspaper in Education) program, Web News Browser, Interface using Maps, Elementary School Children and Teachers in Japan

1 INTRODUCTION

NIE (Newspaper in Education) programs that use newspapers as study materials were started at the United States of America in the 1930s. After that it was started at Japan in 1985. In recent years, NIE programs have been implemented in educational institutions including elementary schools around the world. Especially, it is being aggressively promoted in the USA, Denmark, Finland,

Norway, Netherlands, France, Germany, Brazil, Korea, Colombia, Belgium and Japan. In NIE programs, teachers use newspaper articles to teach a variety of subjects - history, reading, social science, math, economics, composition, and journalism [1].

In the practical report for NIE programs by the Japan Newspaper Publishers & Editors Association [2], it is reported that NIE programs can improve their reading comprehension, grow elementary school children's interest and motivation in our society by providing study materials relevant to their lives, and heightens teachers' interest in new teaching techniques. It is also effective to develop communication skills and improve relations with children's families, because opportunities of conversation related to the contents of news increase between parents and children.

Printed newspapers are generally used in NIE programs. In recent years, the use of Web news is receiving attention in NIE programs, because newspaper publishers provide newspaper articles as Web news on their Web sites. However, these articles are not also written for children. There is a problem that most of elementary school children cannot understand the contents of the articles sufficiently, because the articles contain difficult words and expressions for children. Therefore, it is not easy for children to find interesting articles [3]. From the results of the interview survey with elementary school teachers in Japan [3], it has turned out that elementary school children tend to choose an article only by the title and attached pictures.

In order to improve these problems in NIE programs, we consider that a support system

to choose and browse Web news articles is necessary [4], [5].

On NIE programs in elementary schools in Japan, teachers frequently take up news articles related to children's own town, or give children a task to find interesting articles in their region and elsewhere. The children can learn various topics, features and events of their region from such articles. Therefore, information about locations is one of important factors for NIE programs in elementary schools in Japan. Furthermore, the children start to learn a map in the curriculum for third or fourth grade of elementary schools.

From the above points, we propose a support system to browse Web news using a map interface in this research. By displaying news articles on the maps, the children can choose and browse interesting articles from the maps, and understand the relationship between the contents of the article and the location easily.

This paper discusses related work, and proposes a system to browse Web news using a map interface for NIE programs in elementary schools in Japan. After that, the usefulness of the proposed system is evaluated, and the proposed system is improved based on the results of evaluations.

2 RELATED WORK – WEB NEWS BROWSER USING A MAP INTERFACE

There are a few systems to browse Web news using a map interface, such as Newsstand [6], [7] for English speakers and Mapnews [8] for Japanese speakers. Figure 1 shows a screenshot of the interface of Newsstand. These systems extract information about the location from each Web news article, and place a marker indicating the article on the maps based on the extracted information. The system using maps as a browsing interface is very useful for finding, choosing, and browsing articles related to geographic locations that readers are interested in, because they can visually recognize the relationship between the contents of the articles and the locations.

However, when these systems are used for NIE programs in elementary schools, there are following problems:



Figure 1. A screenshot of the interface of Newsstand [5]

- (1) These systems display unnecessary news articles on NIE programs in elementary schools, because these systems do not have a function to filter out the unnecessary articles;
- (2) Children cannot use categories for choosing an article on the maps, because Mapnews does not classify markers on the maps;
- (3) Children cannot narrow down articles by some conditions such as categories, the date of issue, a period of time;
- (4) It is difficult to grasp the outline of an article from information displayed, because only the title or headline of the article is displayed after clicking a marker;
- (5) Children cannot understand the contents of news articles because the articles contain difficult terms and phrases;

For the reasons described above, it is difficult to use these systems for NIE programs in elementary schools in Japan.

3 PROPOSED SYSTEM

3.1 Basic Functions

In order to clear the problems (1) to (4), we propose a system to browse Web news using a map interface for NIE programs in elementary schools in Japan. The main target users are teachers and senior children at elementary schools.

We have developed a system which has the following functions:

- (1) Filtering unnecessary articles for NIE programs
- (2) Color coding of markers based on categories
- (3) Narrowing down articles

Figure 2 shows a screenshot of the main interface of our prototype system with the functions (1) to (3) above.



(a) Main interface



(b) Color Markers based on 8 categories

Figure 2. A screenshot of the main interface of the proposed system

As shown in Figure 2 (a), the map based on the Google Maps API [9] is displayed at the center of the main interface. The system extracts information about the location from each Web news article, and place markers indicating the articles at the appropriate positions on the map. The neighboring markers are consolidated based on zoom levels, and the number of the consolidated articles is displayed in the circle.

As shown in Figure 2 (b), each marker is given different color according to the category of each article. Articles are classified into eight categories (culture, society, government, economy, environment, education, sports, and science) by a naive Bayes classifier.

The input form to narrow down articles by keywords, a period of time, and categories is arranged on the upper side of the map.

If a marker is clicked, an information window consisting of the title, image, date of issue, publishing company, and hyperlinks to all locations of the article is displayed as shown Figure 3. Below the map, the list of articles placed at the same location is displayed. When a title of an article in the list is clicked, lead sentences of the article are displayed under the title. All locations in the text of each article are linked to maps. Readers can confirm the locations on the maps by clicking the interesting locations in the text or the information window.

As for the problem (5), we are researching a method of text simplification for elementary school children.



Figure 3. A screenshot of an information window and a list of articles placed at the same location

3.2 How to Place Markers Indicating News Articles

The process of placing markers indicating news articles consists of the following three steps.

Step 1: Collection of Web news articles and information extraction from the articles

This system collects news articles from Web sites of various newspapers. The articles related to such as drugs and homicides are filtered out from the set of articles, because they are rarely used for NIE programs in elementary schools. This function can be turned off. The system has the option to set black words for filtering articles. Then, the title, body, image, URL, date of issue, and publishing company are extracted from the collected articles.

Step 2: Extraction of locations from the articles

The system extracts information about locations from each article by using Japanese Named Entity Extraction API by goo Lab [10]. By our preliminary experiments [11], we have confirmed that approximately 83.5% of the news articles contain information about locations.

Step 3: Placing markers on the maps

The system gets latitude and longitude of all locations of the article by Google Maps Geocoding APIs. In the news text, a location is abbreviated after the first mention. If the same coordinates are obtained by APIs, the longest name of locations is selected as one of the representative locations of the article. If the coordinates of “Kagawa” and “Kagawa Prefecture” are same, the latter is selected. When locations of the different level in the same prefecture were extracted, both locations are used for markers. If “Kagawa prefecture” and “Takamatsu city” are extracted from an article, both of them are selected as the representative location.

The proposed system places markers indicating the articles at the appropriate position on the maps based on the coordinates. If there are multiple articles in the same locations, the marker of the latest article is set as the representative one.

3.3 Function of Narrowing Down Articles

In order to find interesting articles, the proposed system has the function of narrowing down articles by categories, a period of time, and keywords. Keywords and a period of time are input from the input form. A period of time is set to a week by default.

As for categories of news articles used for our system, we adopted eight categories: culture, society, government, economy, environment, education, sports, and science. We adopted these categories which are frequently used in Web news sites of national daily papers in Japan such as Yomiuri, Nikkei, Asahi, Mainichi, and NHK.

3.4 Function of Hyperlinks of Locations

The information window has hyperlinks of all locations of the news article. Readers can move to the related locations of the article on the map freely by using this function.

Figure 4 shows screenshots of moving the related locations by the hyperlinks.



Figure 4. Screenshots of moving the related locations by hyperlinks

4 EVALUATION

4.1. Evaluation of Location Extraction

4.1.1 Outline of the Evaluation

In the proposed system, it is important that markers indicating the articles are placed at the appropriate position on the map. The proposed system extracts locations from articles by the method mentioned in 3.2. We conduct the experiment to evaluate the performance of the proposed method with 100 articles of local news extracted from NHK WEB NEWS randomly. In this experiment, the proposed method extracts locations from the title and lead sentences of each article. The locations extracted manually are used as the correct locations. The performance of the proposed method is evaluated with each value of the precision, recall, and F-measure.

4.1.2 Evaluation of the Extraction Method

As a result of the experiment, the value of recall was 0.876, the value of the precision was 0.923, and the value of the F-measure was 0.899. Since the values of recall and precision were about 90%, both of them were the high values.

The result of error analysis, it turned out that errors were caused by not the proposed method but outputs of the Japanese Named Entity Extraction API. For example, “Fudomyo-o (Acala; the God of Fire)” and “Suginoki (cedar)” were extracted as locations, however, these were used as common nouns in the articles. It is difficult to distinguish these words which can be used for both location and common noun by the context. Since “Europe”, “the West”, “the Sikoku region”, and “the Kansai region” which were extracted incorrectly are region, these are not suitable for placing markers. Typical region names can be excluded by registering and using the black lists.

Next, we analyzed location which could not be extracted. As a result, names such as parks, schools, and courthouses were extracted as organizations by the Named Entity Extraction API. The organizations which can be obtained latitude and longitude by Google Maps Geocoding APIs will be used as locations.

4.2 Experiment based on Questionnaire

4.2.1 Outline of the Evaluation

As preliminary experiments of the proposed system, we conduct the experiment to evaluate the usefulness of interfaces and functions. The experimental subjects are 10 students from Kagawa University. We asked the subjects to use the proposed system about 10 minutes as a teacher for NIE programs in an elementary school. In order to compare the existing system and the proposed system, we asked the subjects to use Mapnews under the same situation, and to answer a questionnaire.

The questionnaire consists of three major items of “browsing news”, “narrowing down news”, and “comparison with Mapnews” based on 4-point Likert scale (4: Strong agree, 3: Agree, 2: Disagree, 1: Strong disagree), and the column of comments.

4.2.2 Evaluation of the Browsing News

The section 1 in Table 1 shows the evaluation results of “Browsing Function”. All representative values except for the item 1-5 were higher than 3.0. As for the item 1-5, the value of the average is 2.6 which is lower than that of other items. Therefore, we have to improve the design of the news list or supplement the information of the list when readers use this system.

4.2.3 Evaluation of Narrowing Down News

The section 2 in Table 1 shows the evaluation results of “Narrowing Down News”. All representative values except for the item 2-4 were higher than 3.0. From the evaluation result of the item 2-4, we can see that the value of the median is 2.6 and the value of the mode is 2.0. Therefore, we can say that the subjects evaluated that the switch buttons for narrowing down by categories were not intuitive. We have to improve the design of the buttons.

4.2.4 Comparison with Mapnews

The section 3 in Table 1 shows the results of “Comparison with Map Newspaper”. As you can see that all values were higher than 3.0. On NIE programs in elementary schools, we

confirmed that our system is more useful than Mapnews.

Table 1. Experimental Results

1	Browsing News	average	median	mode
1-1	Items in the information window is appropriate.	3.4	3.5	4
1-2	Design of the information window is appropriate.	3.2	3	4, 3
1-3	Hyperlinks of all locations in the information window are useful.	3.3	3.5	4
1-4	Design of the news list under the map is appropriate.	3	3	3
1-5	News list is intuitive.	2.6	2.5	2
1-6	Display of the contents of the article is appropriate.	3.5	3.5	4, 3
1-7	Hyperlinks of all locations in the article is useful.	3.2	3	4, 3
2	Narrowing Down News	average	median	mode
2-1	Function of narrowing down news by keywords is appropriate.	3.3	3	3
2-2	Function of narrowing down news by a period of time is appropriate.	3.6	4	4
2-3	Function of narrowing down news by categories is appropriate.	3.2	3	4, 3
2-4	Design of the function of narrowing down news by categories is appropriate.	2.9	2.5	2
3	Comparison with Mapnews	average	median	mode
3-1	Categories of news are more useful for browsing than Mapnews.	3.9	4	4
3-2	Hyperlinks of all locations in the article is useful.	3.2	3	4, 3
3-3	Narrowing down news is easier than that of Mapnews.	3.8	4	4
3-4	Narrowing down by a period of time is more useful.	3.9	4	4
3-5	Narrowing down by categories is more useful.	3.7	4	4

Figure 5 and 6 show the representative comments about the interface and the functions of the proposed system. We can easily improve the interface based on the comments in Figure 5.

As for the comments of functions in Figure 6, we can achieve all comments except for the last. In order to achieve the last comment, we have to consider how to collect the information about the principal products and the climate of the distinct area firstly.

Figure 5. Representative comments of the interface

- Readers cannot set the maximum number of markers displayed on the maps.
- The function to cancel narrowing down news is necessary.
- The function of full text search is necessary.
- It would be better that the principal products and the climate of the display area are displayed on the maps.

Figure 6. Representative comments of the functions

- The supplementary explanation of hyperlinks of all locations in the news should be added.
- As for the interface of narrowing down news by categories, the checkbox is more intuitive than the switch button.
- It is not easy to confirm locations where the focus moved on the maps after clicking the hyperlinks of locations in the article.
- The date of issue of news should be displayed in the news list.
- Too many markers for one article were placed. One marker in a prefecture per one article should be placed.

5 IMPROVEMENT OF THE PROPOSED SYSTEM

5.1 Improvement of the Extraction Method of Locations

In order to address the last comment in Figure 5, a hierarchical relationship of locations has to be investigated automatically. If “Kagawa

prefecture” and “Takamatsu city” are extracted from an article, the latter should be selected as the representative location because “Takamatsu city” is in “Kagawa prefecture”.

We improved this problem by developing a new database consisting of information of a hierarchical relationship between prefectures and cities. When locations of the different level in the same prefecture were extracted, more concrete location can be generated as the representative location after investigation based on the information of the hierarchical relationship in the new database. If “Kagawa prefecture” and “Takamatsu city” are extracted from an article, “Takamatsu city, Kagawa prefecture” is generated as the representative location after the investigation of the hierarchical relationship between them.

5.2 Improvement of the interface

We improved the design of the interface of the proposed system based on the evaluation results of Questionnaire. Figure 7 shows the improved interface of the system.



Figure 7. A screenshot of the improved main interface

We changed the interface of the function of narrowing down articles by categories from the slide box to the checkbox in order to improve the results of the question 2-4 and the comments in Figure 5. Figure 8 shows old design and new design for narrowing down by categories.



Figure 8. Old and new design for narrowing down articles by categories

In order to address the comment in Figure 6, we developed an input form for changing the number of markers displayed. Figure 9 shows the new input form.



Figure 9. Input form for changing the number of markers displayed

6 CONCLUSION

In this paper, we proposed the system to browse Web news using a map interface, in order to provide support for NIE programs in elementary schools in Japan. We confirmed the usefulness of our system through the evaluations. Then, we improved the extraction method of locations and a part of the interface of the proposed system based on the evaluation results.

In the future work, we are going to ask elementary school teachers to use our system and answer the questionnaire, in order to evaluate the usefulness of the proposed system. Then, we will improve the proposed system based on the evaluation results. After that, we will integrate the proposed system with our other research for providing support for NIE programs, such as the method of text simplification and the method to search for image contents for supplementing the contents of news articles. Finally, we will make a comprehensive evaluation of the integrated system at elementary schools in Japan.

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