Translation of Text into Iconic Expressions to Support Reading Enhanced by Related Web Pages

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Abstract:

Active utilization of museums has attracted attention over the years from the perspective of lifelong learning. However, museum users have various interests and degrees of knowledge.

We propose a system of translating explanatory texts about museum collections into iconic expressions by linking the texts to the museum website contents. In this system, the text is selected based on the users’ previous web access.

We introduce a basic structure of our prototype system, and explain the function of expression part by showing the sample in which an actual webpage is used. We plan to investigate this system’s effect on the museum users.

1 Introduction

Materials related to humanity such as history, folk customs, and art, and those related to natural sciences, such as animals, plants, and engineering are included in a typical museum. The beauty of the materials appeals to visitors as ornamentation. The materials’ historical value and scientific features also attracts visitors’ interest. Much information is consolidated in the museum collections. Such background information promotes a deeper understanding of the materials themselves. From the perspective of lifelong learning, active utilization of museums has increasingly attracted attention over the years.

However, museum users’ interests and degrees of knowledge are various. To promote better understanding of the materials’ explanatory text, it is important to choose content that is appropriate to each user’s interest then show that content effectively to users.

Our target of research is adult users who have already left school. Most of them would not have special curriculums, teachers or classrooms for study. To prepare lifelong learning environment to them, it is important to find the things that stimulate their interests and encourage their inquiring mind continuously. We focus on the active utilization of digitized museum collections and their explanatory texts. And we propose a prototype system which takes advantages of web access logs and the contents already exists on the web.

Our prototype system comprises two parts: 1) a recommendation part analyzes a user’s interests based on his/her past web access and selects the proper explanatory text; 2) an expression part extracts images from an accessed web page and adds them to the corresponding text. In this paper, we introduce a basic structure of our prototype system, and
explain the function of expression part by showing the sample in which an actual webpage is used.

2 Related Work

2.1 New Discovery at the Museum

Many attempts (e.g., [1], [2], [3]) have been made in many museums to use museums better as learning places. Such attempts are intended to arouse users' interest and attention to the collection items, then lead them to discover additional interesting features.

In some cases, a quiz concerning the museum collections is presented to museum users (e.g., “What is the smallest animal you can find (in the target picture)?” or “What is written on the wooden plate?”). In other cases, by making users sketch the museum collections, some features might be given particular attention. In both cases, curators attempt to direct the users’ attention to a detailed viewpoint of the exhibition that they might otherwise miss unless being asked to look at directly. Furthermore, such quiz papers are used for orientation in the museum.

The MoMA and the HCI specialists’ collaborative approach [4] is pursuing a new interactive way using computer system. Their system has been developed around a concept that integrates following three factors: an understanding of technology, the user and the context in which the system will be used, and creative insight. In one of their systems, the user can freely sort the pictures by author. Through that approach, they tried to stimulate museum visitors to discover new concepts and knowledge related to art, along with widely various concepts that the curators sought to convey to visitors.

2.2 Utilization of Digitized Cultural Heritage

Cultural heritage preserved in museums and art galleries are served as important resources of education and learning. Moreover, the use of digitized cultural heritage draws people’s attention in the field of learning ([5], [6]).

To enable flexible sort or retrieval and to meet the various needs from the user, preparing more detailed metadata became important issue. In the field of web-based educational system, for the aspect of reusability and adaptability of multimedia elements, the importance of the metadata has been discussed for years [7].

For the CEAX project undertaken by Aihara et al. (e.g., [8], [9]), they focus on the digitized cultural heritage objects and propose a framework that supports growing metadata and its use. Their CEAX Voyager is an exploiting tool for contents of CEAX, and designed for supporting guided discovery learning in classrooms. In experimental classes conducted at an actual elementary school, they observed pupils’ willing to read descriptions.

Our system characteristically uses the existing data on the web. And we propose a structure which does not need special preparation of metadata.

2.3 Recommendation as an Adaptive Learning System

In our approach, the target users are adult and we intend to present information that is continuously matched to their interests. Therefore, to estimate the user’s preference and recommend new information matches to it is very important.
Recommendation based on users’ access history (and sometimes additional user information such as past purchases) has been actively used [10] in commercial fields. Amazon.com [11] is a famous example of recommendation for commercial purposes. At that site, a system recommends new purchases related to users’ past access history and actual purchase results. Web access is assumed to reflect a certain kind of user interest.

We apply this technique to the field of learning. Using this approach, we propose an adaptive and continuous learning mechanism that is amenable to the user’s preference.

3 Proposed System
In our approach, we first collect access log from each user to estimate their interest, and select the appropriate explanatory text. Then show the text with related images extracted from the accessed webpage (Fig. 1).

3.1 Text Selection
The system accumulates access logs from each user’s computer and analyzes them to extract keywords from their original webpage. To extract words from Japanese sentences, which are not space-delimited, we use morphological analyzers: mecab ver. 0.97 and mecab-ipadic ver. 2.7.0 [12]. The mecab dictionary is customized to apply text related to museum collections written by the specialist.

To calculate tf*idf scores, we used the Estrainer system ver. 1.2.29 [13]. We also used this system and its vector space model for estimation of the degree of similarity between documents.

3.2 Image Extraction from Web Pages
A screen images are depicted in Fig. 1. In these samples, we used html data from the Tokyo National Museum website [14] to produce a sample image dataset. We then added images to the corresponding explanatory text.

In the left sample, the text in the middle explains the glass works in the Kofun (tumulus) period in Japan. Furthermore, additional images extracted from museum web page about the
“Collection List” are arranged around the text. This original webpage includes these images of glassworks in the Kofun period and other images of different periods. Our system only picked up the images relate to the explanatory text. In the right sample, the text explains about the ancient Japanese mirror. And correspond image extracted from the website is arranged. Tooltip text, which shows its alt text, emerges on the upper left of the screen if the user moves the mouse on the image.

We prepare an image dataset from the html files collected from the museum website. The images are extracted from the html based on their tag information “<img” and are labeled by their alt attributes. This alt attribute is recommended for addition to the image from the viewpoint of usability for an alternative display of it. Many official pages are expected to include them.

Then HTML data are analyzed and the keywords are extracted from the web pages. The keywords, which are scored according to the tf*idf value, the image path, alt attribute, and correspondent keywords, are preserved in the image dataset.

4 Future Work
We intend to present our prototype system to actual museum users to evaluate its function from the viewpoints of arousing interest and understanding the collections. Moreover, we plan to investigate effects of our system on users’ real actions to the museum, such as visiting the museum or arousing interest in the real collections.
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