

CEAX's Learning Support System to Explore Cultural Heritage Objects without Keyword Search

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Recently the contents for culture heritage objects have been digitalized and are distributed on the Internet, the amount is increased. To use the contents for the educational purpose, one of important element is a search method for the contents. Since the descriptions of the metadata or the annotations may be hard for pupil, they may be unthinkable keywords for search. In this paper, we propose learning support system called CEAX Voyager which has tools for exploration of the objects without keywords. To show the feasibility for our CEAX Voyager, we tested using the prototype system of the CEAX Voyager at an authentic elementary school. As the result, the learners had a strong desire to become aware of the contents, and the prototype system was accepted by the content creators such as museum experts and school teachers.

Keywords e-learning environment; learning support system, metadata, search, prototype system

1. Introduction

Recently the contents for culture heritage objects have been digitalized and are distributed on the Internet [1] [5], the amount is increased. Most of the contents have metadata with varies multimedia such as images, voices and movies. However, the methods of using the collected contents for educational purpose is seldom researched or studied. In CEAX (stands for Educational use of Cultural heritage Archives and Cross(X) search) project, we have been carried out the establishment of a metadata structure for the contents, a management of the contents and development of learning support system which utilized the contents.

The key of the utilization of the contents is a search method; a description of the culture heritage objects may be hard for children, the metadata has some needless attributes, and all descriptive levels of the metadata are not same. In this paper, we propose learning support system called CEAX Voyager which has three methods for exploration of the contents without keywords; contents presentation method, graph method and classification support method. Moreover, we have been researched and developed not only CEAX Voyager but also some systems for the content utilization for the educational purposes; the content management system (Owlery), contents search service (CEAX Search service), and authoring tools for teaching materials and the contents (Owlery Client) .

The paper is organized as follows:

- Section 2 presents the exploration functions of CEAX Voyager.
- Section 3 illustrates overall system of CEAX, and describes Owlery, Owlery Client and CEAX Search.
- In Section 4 shows the feasibility for our CEAX Voyager. We tested using the prototype system of the CEAX Voyager at an authentic elementary school in Japan. The learners were 89 6th-graders from three classes. As the result, the learners had a strong desire to become aware of the contents, and the prototype system was accepted by the content creators such as museum experts and school teachers.

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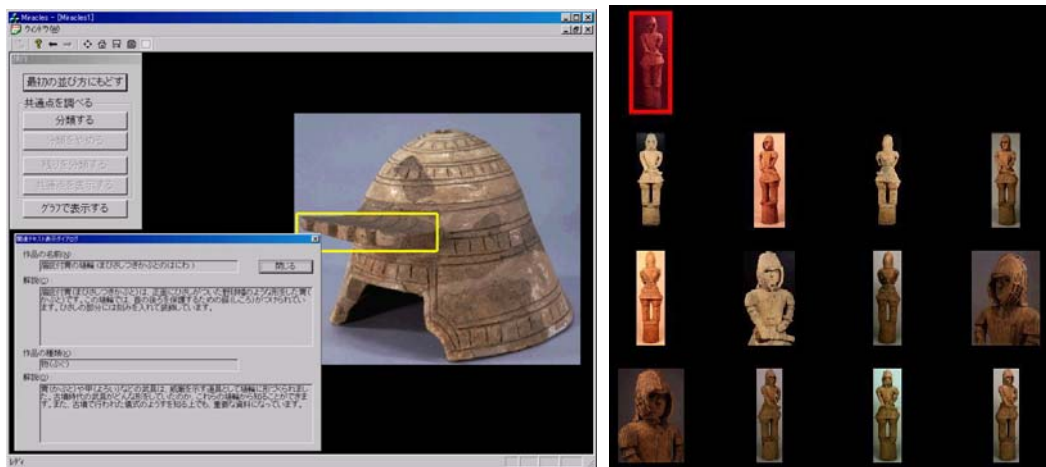


Fig. 1 Display image and description of the content (left) and an example of a result of related images (right)

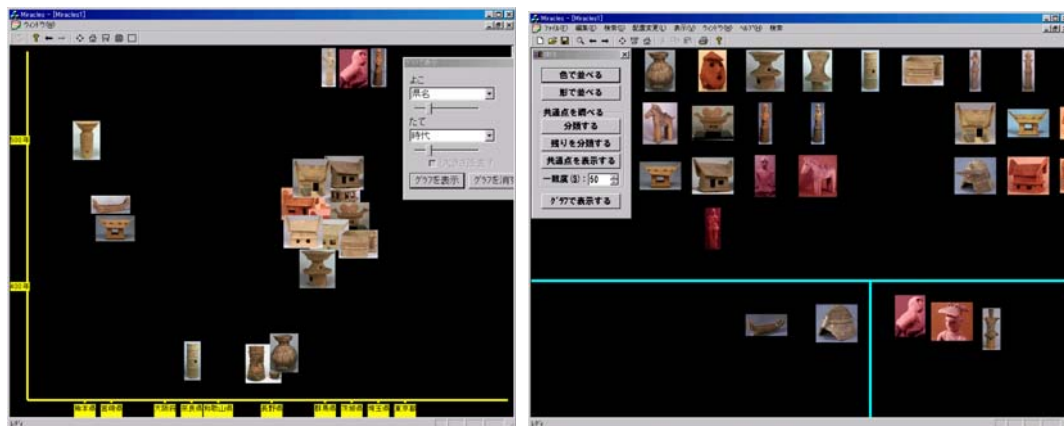


Fig. 2 Graph Layout (left) and classification function (right)

2. Exploration of CEAX Voyager

CEAX Voyager is a learning support system which can explore for the contents (such as cultural heritage objects). Users can view scattered object images in a two-dimensional space and zoom in on an image, and a high-resolution image. Basic functions of CEAX Voyager are as follows:

Content presentation function: The function supports display images, metadata, annotations and checkpoints of an object. Figure 1 shows an example of the function. A user can show object image, and a checkpoint is highlight remarkable regions of the image (indicated in the yellow box) (Fig. 1. left). One object may have some images. The function enables to collect images of same content. Moreover related objects can be shown on the layout (the object unearthed in the same place), although a strict Boolean matching is used in the CEAX Voyager. This approach is similar to the “Ostensive Search”, search without query, proposed by Ian Campbell [4], and thought to be effective and useful for users who do not have clear search requests prior to the search.

Graph function: Using the graph function, images can be placed according to two axes chosen by users (e.g. the location, an era, a type) in the 2-dimension space on the CEAX Voyager (in Fig 2. left).

Classification function: The function may show some differences between two groups which users make suitably. When a user wants to find some common factors of two groups or hidden relation amongst objects, they put a few exemplars into a corresponding segment which is indicated by the two bottom regions (in Fig 2. right).

3. CEAX System

The functions of CEAX Voyager may be efficient if a user cannot predict what contents are in, because the user cannot think of a suitable keyword. However, it is necessary to prepare “rich” metadata, in order to fully utilize the functions.

In the project, we have been researched and developed not only CEAX Voyager but also some systems for the content utilization for the educational purposes; the content management system (Owlery), contents search service (CEAX Search service), and authoring tools for teaching materials and the contents (Owlery Client). Figure 3 shows our system for educational support. To set course materials which CEAX Voyager can utilize, we have been developing the following systems.

Owlery(middle): The system manages metadata, annotations, and images of cultural heritage objects[2]. The contents are made by experts such as curators of museums. (S)he uses our client system called Owlery Client, for authoring metadata and descriptions about the objects, and register of images too (left). Educators use same Owlery Client for preparation of course materials. Owlery Client enables an educator to rewrite the descriptions if the descriptions of the contents which are due to be treated are not appropriate to the course. Moreover, an educator can select some attributes of metadata for cultural heritage objects which is utilized on CEAX Voyager.

CEAX Search Service (Middle): If an educator wants to utilize objects on the Web, (s)he can the import the objects via CEAX Search Service which gives flexible full text search methods based on RS-model[3].

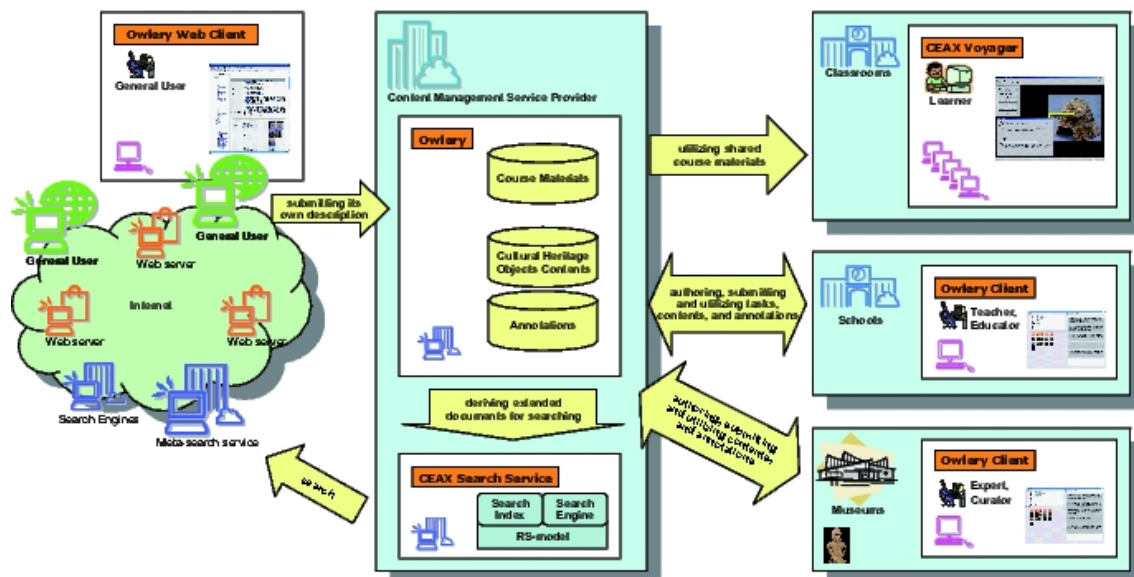


Fig. 3 The system in the CEAX Project

4. Feasibility Test

4.1 Experimental Setup

We developed the prototype system of CEAX Voyager, and experimented to ensure the usefulness of the prototype system's methods at an authentic elementary school in Nishi-Tokyo city. In the experiment, the learners were 89 6th-grades from three classes. The class theme was to discover the secret of Haniwa which is familiar to the learners. Table 1 shows an example of using metadata of Haniwa in the experiment class.

For the feasibility test, we chose historic heritage objects from the Kofun period of Japan, which was from the late 4th to the 7th century A.D., including the national treasures of Japan owned by Tokyo National Museum (TMN) which owns the largest collection of Haniwa in the world. We prepared over 180 objects, 860 images, and 380 descriptions. The annotations for the objects and technical terms are described by archaeologist, and are rewritten by science writers.

In the experiment, we logged the actions of the learners in CEAX Voyager, and sent out questionnaires to check the usability of the interface.

Table 1 An example of metadata used by the class ("Haniwa armored man")

Attribute	Value
Item No.	J-36697
Title1	[国宝]埴輪武人
Title2	Haniwa Armored Man
Place1	太田市飯塚町出土品
Place2	Object from site at Iizuka-cho, Ota-shi, Gunma
Period1	古墳時代
Period2	Late Kofun period
Dimension1	高 130.5

4.2 Experimental Results

In the result of the questionnaires 89% of them answered that the prototype system is usable. For the results we judged that the prototype system can be operated easy and for them. But some learners pointed out that the operation of a mouse differs from other software, we will introduce general mouse operation into prototype system of CEAX Voyager.

Figure.4 shows that the number of selections of each action in the classes. The most used action was to handle the description windows. The action was not only used against the objects shown in the initial layout on the prototype system, but also used with the relationship presentation method, the classification function or the graph function. We analysed action logs of the prototype system, most of the learners can obtain some interesting search results using the methods, and showed the description, metadata and images of the objects. By the result, we consider that the prototype system raised their study volition.

5. Conclusion

In this paper, we propose a learning support system called CEAX Voyager. To search for cultural heritage objects may be hard, because description of the culture heritage objects may be hard for children. CEAX Voyager enables users to explore without keywords. To ensure efficiently of CEAX Voyager, we developed prototype system, and experiment at an authentic elementary school. As the result, the learners had a strong desire to become aware of the contents, and the prototype system was accepted by the content creators such as museum experts and school teachers.

There are some future issues to consider and they are as follows:

- Learning process monitoring
- Exploration combined metadata and image characteristics

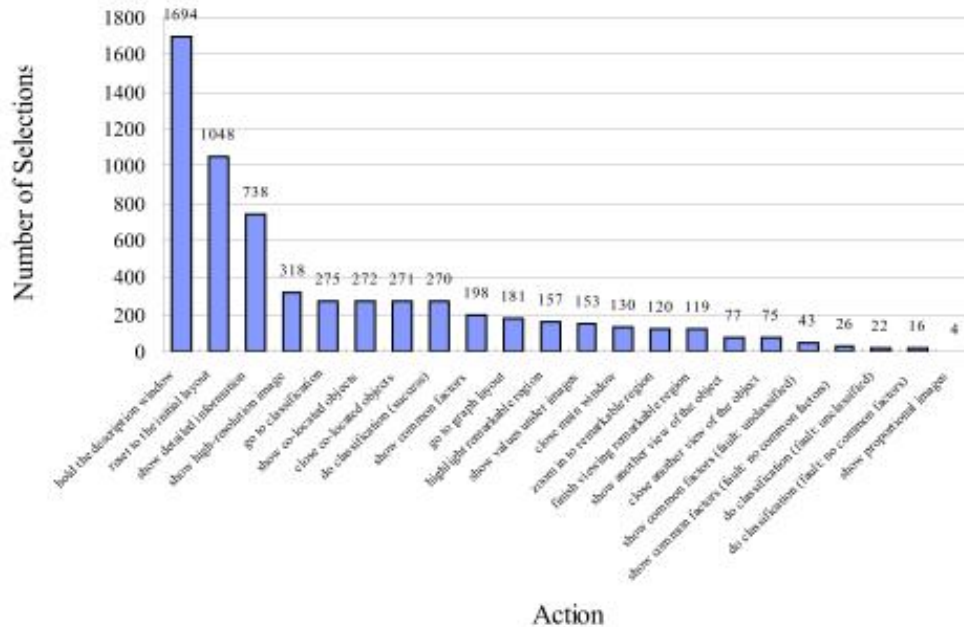


Fig. 4 The number of selections of each action in the experimental classes

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