

Web-based Information Management for Korean Traditional Building Materials

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ABSTRACT

Traditional methods and materials used for Korean buildings need to be well organized and managed so that they can be utilized in modernization of old buildings. Supporting web-based management of information of Korean traditional building materials helps spread the related knowledge. This paper identifies the characteristics of traditional building materials data, and develops an information structure to represent the related information effectively. It also describes design decisions on web-based user interfaces to support flexible browsing and retrieval of the managed data. As the traditional building data are described by old domain-specific technical terms, utility of the developed service might be limited to those who are familiar with the terms. As an approach to tackle this problem, the proposed system supports user tagging by allowing users to classify the stored information using their own terms, and also to retrieve data using the user-supplied tags.

Keywords: Korean Traditional Building Materials, Web-based Retrieval, User Tagging

1. INTRODUCTION

Traditional materials and techniques for construction are gaining increased attention these days as they are environment-friendly. Many efforts to develop new techniques and methods for modern building construction by exploiting the traditional materials and building methodology are being paid [1], [2]. Deeper understanding of traditional building methodology is essentially required to make these efforts more active and proliferating. An information service that manages and provides data related with the traditional building material will play a very important role to make researchers and practitioners with the same interests share their knowledge with each other. It also helps to make efficient use of the previous research

results and even to trigger new research activities.

Techniques for building web information service are evolving [3]-[5]. Applying such techniques aptly in web-based management for traditional building materials will influence the utility of the developed service greatly [6], [7].

Information sources for the traditional building data are usually old books and documents which are written in difficult Chinese characters [8]. Data related with the traditional building are not arranged in specific documents but are dispersed into a lot of books and documents. In order to develop an information service for traditional building materials, data need to be identified, gathered and classified in a systematic way. Gathering and classifying data for traditional building materials are processed in parallel to development of the management system.

This is an excellent paper selected from the papers presented at ICC 2008.

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While developing a web-based traditional building material information system, how to classify the related data needs to be considered during the design phase as it will affect how data will be searched and managed. The classification scheme and the corresponding coding system need to be flexible enough, since data collection process is not completed and being processed together with the development process. Terms for the traditional building material are usually in Chinese characters, and are very difficult to read and understand for ordinary users. Users of the developed information service will face difficulties when they try to access the system through the provided retrieval mechanism if they have to use those difficult terms. So, the user's convenience needs to be taken into consideration in order to improve efficiency and reduce the burden of using the system.

In this paper, we describe a development of a web-based information management service for data on materials used in traditional building construction. The proposed system supports management of the related data including its retrieval. Its goal is to provide a stage for the community members who are interested in traditional building construction and in application of traditional materials and techniques to the modernized traditional buildings. In section 2, we describe the data collection stage for Korean traditional building material information. Section 3 describes overall system architecture and a series of issues for web-based services on traditional Korean Building material information. Especially, user tagging is elaborated for effective information retrieval by users. Section 4 describes some of the implementation examples to show effectiveness of our approaches. We conclude in section 5.

2. CHARACTERISTICS OF THE TRADITIONAL BUILDING MATERIAL DATA

Data on traditional building materials are derived from old books that contain architectural description of old buildings by extracting the part of paragraphs describing usage, application of traditional architectural materials, etc. One example of those old sources is a series of volumes[8] which records the building process of a castle built by the order of King JeongJo during Chosun dynasty. They contain records for building plans, man power, source of materials and their usage, execution of the construction, etc. As an example, according to the analysis of the records, building materials related to earth can be classified into 4 categories: Earth, sand, gravel and lime. Sand and gravel were used as aggregates in raw material form. Earth and lime were mainly used as processed materials through mixing, molding, firing and drying. Types of the processed materials for each raw material can also be identified. For example, earth was processed into roofing tiles or earth bricks. Lime was processed into lime itself or a mixture of lime, fine sand and yellow soil. Likewise, traditional building materials found in [8] is categorized into 6 categories according to whether they

are used as raw materials, or processed materials, phase of building process materials are applied, their manufacturing facilities, related artisans, and tools used for the materials. Each category is again classified into 2 more levels by the related terms and specific examples in the records. Table 1 show an example of classification for the raw and processed materials. Data collected from the documents are assembled together with some metadata. Data for each traditional building are arranged into a card entry.

Table 1. Example of materials classification

Raw materials	earth(土)	sand(沙)	gravel(礫)	lime(石灰)
Processed materials	roofing tile(瓦), brick(甃), brick(甃)	nothing	nothing	lime(灰), mixture with 3 materials(三物)

Table 2 shows an example of an assembled data in a card entry form.

As we can see from the above example, traditional building material data are composed of a set of metadata, old terms and phrases written in Chinese character. Also, the classification of data is based on old and specialized technical terms. When we manage these data on a web-based system, users may experience some difficulties with accessing the stored data if there are no facilities to reduce users' burden that could result from the specialized terms. Another issue to note is that data collection and analysis are not completed yet. A web-based system considering only currently collected and analyzed data is now being developed. This implies that types of traditional building materials may be increased as the scope of document search expands, which in turn requires consideration of possible extensions in implementing classification scheme for the developed service.

Table 2. Sample data card representing a traditional building material data item

Data card ^o					
Material name ^o	lime(石灰) ^o		Serial No. ^o	004 ^o	
Source ^o	Kyujanghak SNU ^o		Searcher ^o	D. Kim ^o	
Document Name ^o	회성실역의례 국역증보판(상) ^o		기전문화에 활용서 16, p.5 ^o		
	Kysongki Culture Foundation ^o		2005 ^o		
Classification ⁿ	Material.	Manufacture.	Processing.	Artisan.	Tools.
	Raw/Lime(石灰) ^o	nothing ^o	nothing ^o	nothing ^o	nothing ^o
Original Paragraph ^o	插備中裝物雜物炭石灰瀉雜五種之傳隨窠不均或加或減 ^o (雜城營役傳載 凡例 三) ^o				
Interpreted into Korean ^o	조미 중에서 곡식 종류나 청흙이나, 숯, 자갈과 같은 다섯 종류의 같은 자물일 때마다 가격이 일정하지 않아서 값이 폭 더하기도 하고 폭 덜어기도 한다. ^o				
Original Image ^o					
Illustration ^o	nothing ^o				
Drawing ^o	nothing ^o				
Picture ^o	nothing ^o				

3. DATA RETRIEVAL FOR TRADITIONAL BUILDING MATERIALS

After describing the overall system components briefly, we focus on data retrieval facilities supported by the proposed web-based service.

3.1. Overall service architecture and major functions

The developed service is composed of 3 major subsystems. The first subsystem is a data retrieval subsystem which supports search for the stored material data. The proposed system supports 3 types of data retrieval for users' convenience, which are retrieval by predefined data classification, keyword-based retrieval, and retrieval using user supplied tags. Data retrieval by predefined data classification utilizes the classification scheme based on the types and levels of categories that has been described in the previous section. Keyword-based search facility supports data retrieval by providing important keywords to the system and finds matching data items from the stored building material data. What mostly differentiates the developed web-based traditional building material information management system from other similar web-based data retrieval services is that the supported search facility includes searches based on user tags that will be described later in detail in section 3.3.

The second subsystem manages collected traditional building material data. It registers managed data into a database. As a data management function, it supports web-based registration of new building material information. In order to facilitate registration of a large volume of collected and classified traditional building material data, the proposed system also supports a kind of bulk loading function. The last subsystem supports web community service functions for those who are interested in traditional building materials. They include functions for community management such as membership management, bulletin boards and an image gallery.

3.2. Data retrieval by classification of traditional building materials

As noted earlier, specialized technical terms in Chinese characters used for describing traditional building materials make it difficult to be used as inputs for keyword-based search functions. In order to search data using classified categories, users need to provide 3 levels of classified values. As all the classified value would be converted into the corresponding code value, we provide a popup-based list interface by showing category values for each level and letting a user choose one item from the provided list. This simple approach greatly reduces the users' burden.

3.3. Application of user tagging

Although information on traditional building material data includes an interpretation of the description in Chinese characters into Korean sentences, it still may not be familiar to non-specialized users. User tagging[9], [10] provides characterization of information by users and supports user-supplied categorization of data. The proposed system attaches the users' own tags to data provided by the system. The supplied tags are separately managed by the system and are used for browsing and searching by users.

The developed service provides membership management as one of the community management functions. In order to be able to attach tags, a user should be a registered member and needs to be logged into the system. Once he retrieves the material data, he can add his own tags.

In order to maintain user tags, two separate database tables are maintained. The TAG table manages a sequence number for each tag, a key value reference to the related traditional building material, and user tag contents which may include multiple tags together. The TAG_SUMMARY table maintains the tag, a frequency of retrieval and a frequency of references by the related material data. The tag in this table is different from that in TAG table in that only a single tag is maintained in each entry, and that every tag in the table is unique. Multiple tags in the TAG table are separated, and each tag is inserted into TAG_SUMMARY table only if there is no such tag in the table.

Tag search is like the keyword search except that search is done for user tags. When a user requests tag search, the system checks whether the TAG_SUMMARY table contains the required tag. When it finds one, its frequency of references is incremented, and the TAG table is searched to find any entry which includes the specified tag in the user tag contents. For each entry found, the corresponding traditional building material data are retrieved as the result.

A Tag cloud is a collection of tags which are interested by the users. According to the degree of importance, each tag is displayed in a different form using its size, font and color. The developed system supports a tag cloud for user tags. Currently, the system includes small number of the most frequently retrieved tags in the cloud.

4. IMPLEMENTATION OF THE WEB-BASED TRADITIONAL BUILDING MATERIAL INFORMATION SYSTEM

Figure 1 shows the main page of a web service for the traditional building material. It is composed of an input area for various types of search(part A), a bulletin board(part B), a window for recently input data(part C) and an image gallery(part D). It also shows a tag cloud(part E). An input area for search provides an integrated form for three types of search provided by the system; category based-search, keyword-based search and user tag search.



Fig. 1. Main page of the traditional building material web service

In the figure 2, the first element in the list means keyword-based search, the second one for tags and the remained items represent the first level elements of the category for traditional building materials.

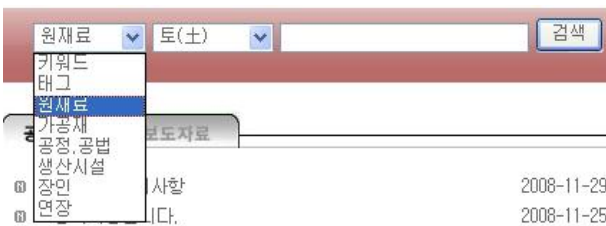


Fig. 2. Integrated input form for searches

Figure 3 and figure 4 shows an example of a keyword-based search where traditional building materials containing "sand" in their descriptions is requested. Search results are displayed in two steps. An intermediate list for the qualified results is provided by showing only part of the building material data. Clicking an item in the list will show its detailed information.

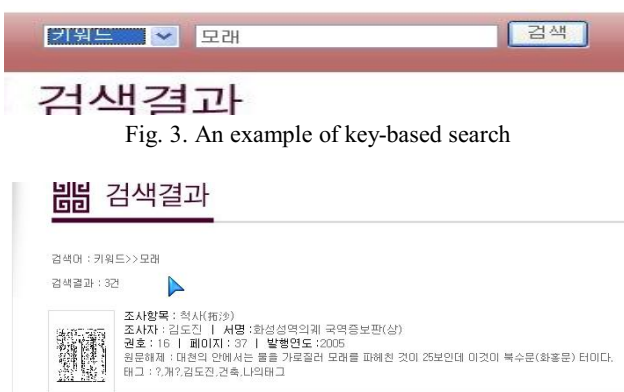


Fig. 3. An example of key-based search

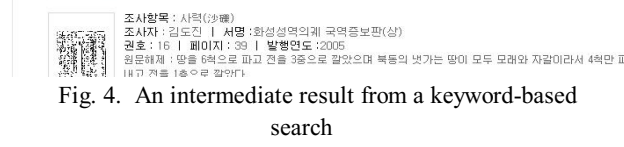


Fig. 4. An intermediate result from a keyword-based search

Figure 5 shows an example of category-based search where "processed material" is composed of five sub-categories, including "roofing tile" and "bricks". Among the sub-categories, "roofing tile" is selected as a target category of data chosen to be retrieved. As we can see from this example, this category-based search can reduce burden of users as they conveniently select one from a set of target category candidates generated by the proposed system without keying-in nor memorizing exact old technical terms for their search.

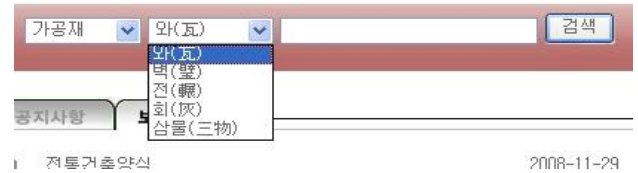


Fig. 5. An example of category-based search

Figure 6 shows a search based on user tag which requests data retrieval for a user tag of 'Seoul'.

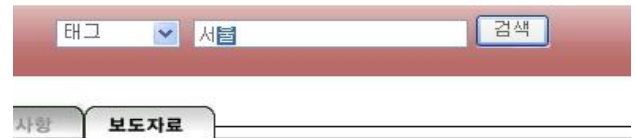


Fig. 6. An example of tag-based search

Basic procedure for tag-based search is almost the same as the keyword-based search except that search is done for user-supplied tags.

A user can also add his tags when he gets a detailed data. Figure 7 shows a part of a search result that includes a tag-input button(part A), and an example of adding a tag of "lime-manufacturing-place"(part B) to the resultant data item. This added user tag will be used in the next tag-based search as one of the candidates for checking whether a user supplied tag has matched the candidates.

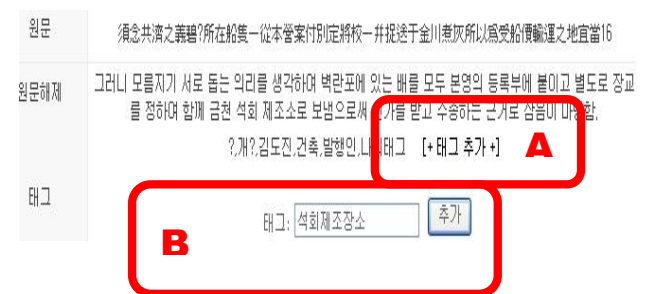


Fig. 7. Adding a user tag

5. CONCLUSION

This paper has described development of a web-based service for traditional building material information. We have described characteristics of the traditional building

material data, and have discussed a set of issues regarding design and implementation of web-based system to support management and retrieval of these types of data. Based on this, we have developed web service interfaces to support flexible browsing and retrieval of the traditional Korean building materials. In order to ease users' burden coming from domain-specific technical terms used to describe the traditional building materials, a selection-based category search has been applied to the proposed system. In addition to this, user tagging and its application to data retrieval has been incorporated to the proposed system. We believe that this facility will improve the utility of the proposed service greatly for the community members by allowing classification of the stored information with their own terms.

This paper has focused on functional aspects of the proposed system. As a further research, we plan to evaluate the impact of applying user tagging on information management of Korean traditional building materials by analyzing users' access behaviors.

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