

CONSTRUCTION OF A DYNAMIC ENVIRONMENTAL KNOWLEDGE WEB FOR A SUSTAINABLE ENVIRONMENTAL DESIGN

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Abstract. This research considered position information and described the construction of an environmental knowledge website of the dynamic user participation type that can collect and send information, and that allows discussion about ecology, the environment, and sustainability. By perusing the distribution of the knowledge using position information on a 2D map and a 3D virtual space, an environmental knowledge website which can grasp spatial distribution was built.

1. Purpose

Sustainable circulated type community improvement united with a natural and social environment in every area is needed. In future, for sustainable environmental space designs, it will be necessary to understand the examples of various eco communities and eco villages, ecology, and the present conditions of energy consumption, etc. In order to collect ecological measurement examples near the user, we concentrate on position information.

Therefore, the purpose of this research is construction of a dynamic environmental knowledge website concerned with position information which can collect and dispatch information about sustainability and world environmental problems.

2. Information and Information Collection Method in an Environmental Knowledge Web

Examples of existing environmental websites which can perform informational collection and informational dispatch about environment or sustainability include the “ECInet (Environmental Information & Communication network)” of National Institute for Environmental Studies and the “ECOfamily” site of the Ministry of Environment, etc in Japan.

Such environment websites carry national and international news, term descriptions, Q&A, etc. The actual examples of eco villages, ecology, and sustainability are summarized by text or pictures in the form of a report.

However, since the position information of each piece of information is not given, it is difficult to grasp the distribution situation of knowledge spatially. Furthermore, there is still no system which can gather and enable perusal of information about the environment, ecology, and sustainability on the basis of 3-dimensional position information. If the position information of environmental and sustainability examples throughout the world is accumulated and can be looked through spatially, an understanding of the distribution situation of this knowledge will become easy.

On the other hand, information creation in existing environment websites is done by the reporter and they are not user participation type sites. In order to simplify the collection and use of knowledge which people have separately placed into this system, it considers as the structure to which a user can participate in a review or contents creation easily.

In this system, information about current examples of environmental problems and sustainability in the world which could be given only partial consideration are dealt with in an old site. Moreover, people can recognize information regarding problems and subjects using position information.

2.1. TARGET USER

It is important to raise the general public's concern about the environment, ecology, and sustainability. Therefore, the target users of the systems are members of the general public who are interested in the environment and ecology.

2.2. INFORMATION INPUT BY A USER

A user can write the following information according to use frequency.

- PIN information which links pictures and texts, such as photographs, to position information
- Questions and replies about the environment, ecology, or sustainability

PIN information can be attached to comments on a question or to replies. It enables it to attach PIN information to the comment of a question or a reply. A system administrator puts the result of the questions and answers in a database, and edits this information to produce an encyclopedia built on the accumulation of knowledge. Using PIN information, a user can search the encyclopedia and the questions and replies across boundaries using a search function. Included in information about concrete environment and ecology, there are many things relevant to places, such as a residence, which is considered in EcoVillage, and environment. In this system, position information, a picture, and a comment are summarized and the information relevant to such a place is stored in DB.

2.3. COLLECTION OF POSITION INFORMATION

GoogleMaps and GoogleEarth represent the latest position display technology on the Internet for acquisition of position information. GoogleMaps is 2D map software which allows a digital map to be used with a mouse. Moreover, in GoogleMaps, an API (Application Program Interface) currently produced by JavaScript is offered. GoogleMaps can be installed on a website using the API. There is a DB of the construction work by HONMA etc. as research on DB using GoogleMaps. GoogleEarth is 3D map software which can also be said to be a "digital globe" with which viewers can peruse satellite and aerial photographs from all over the world. API is not exhibited although position information can be referred to in 3-dimensional virtual space in GoogleEarth. For example, position information acquisition etc. uses GoogleMaps for web development of the function realized by API.

3. System Configuration

3.1. WHOLE COMPOSITION

The following functions are realized so that not only specialists but also the general public may register information positively and may use the system. (Figure 1).

PIN function: Input and peruse the text information which has added position information, and the PIN information which is picture information. A user can accumulate his PIN information.

Question-and-answer function: Ask and answer about environment, ecology and sustainability.

Encyclopedia function: Edit the information accumulated by the question reply function, and use it as a dictionary.

Community function: Make a community about the environment, ecology, and sustainability, and exchange opinions with various persons and via a bulletin board on the web.

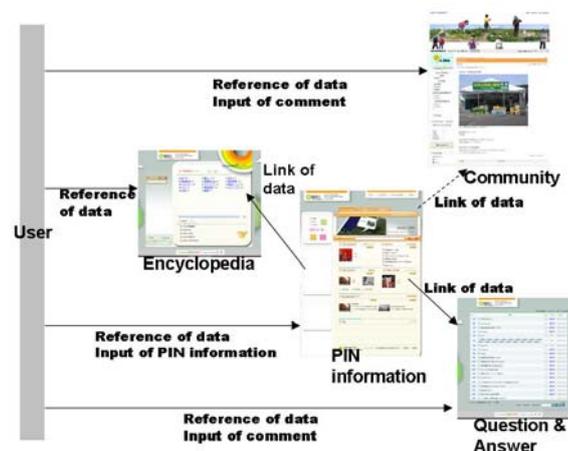


Figure 1. Relation of the function in a system

3.2. COMPONENT ENGINEERING OF SYSTEMS DEVELOPMENT

The following technology was utilized and developed in order to realize the above composition. The bulletin board function, the dictionary function, the question function, and the community function were developed by using the commercial bulletin board creation system ZEROBOARD as a base. Regarding the XML file DB for linking the database creation which coordinates each function, JavaScript and PHP were used to develop acquisition of the position information on latitude longitude, automatic creation of the KML (Keyhole Markup Language) file of GoogleEarth, and a KML file with a DB of the dictionary and the question function.

3.3. SYSTEM CONFIGURATION

System configuration is described focusing on the handling of PIN information, as shown in Figure 2.

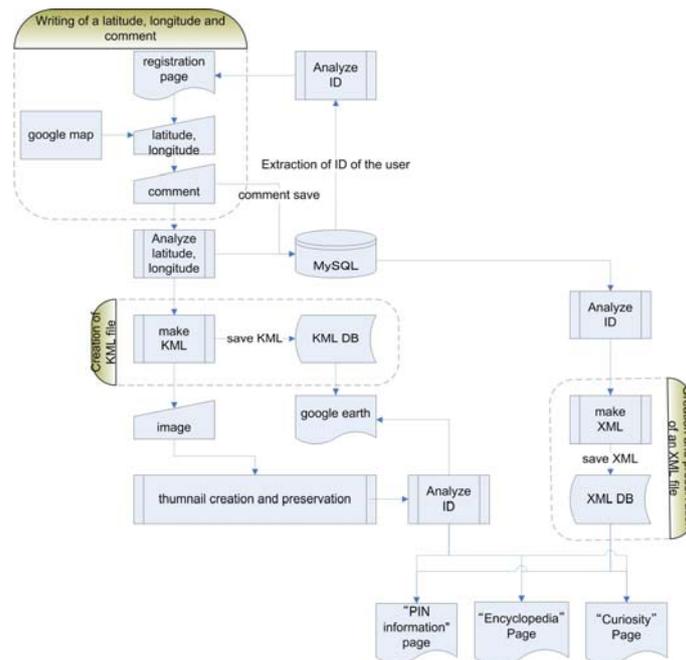


Figure 2. System Configuration

3.3.1. Input of position information, comment and image

The title, comments, position information, pictures, and related URL information are input (Figure3). There is an API function called GClient Geocoder, which acquires latitude and longitude from address information in Google Maps API. Addresses in Japan were not supported at the GClient Geocoder public presentation. Therefore, the input of position information used the following procedures. Position information is first specified as latitude and longitude information from the center of a map of suitable size displayed using Google maps API.

3.3.2. Creation of a KML file

The analyzed position information is stored in the DB. Furthermore, using a DOM (Document Object Model) described by JavaScript using position information, a KML file is created and is stored in the DB. DOM is technology which expresses Document in the combination of Object. By using XML DOM, even if it does not rewrite a page, it becomes possible to display new information on the web browser.

3.3.3. Links between position information and other functions

The comment of a question function or an encyclopedia function is linked with position information by the following method. A KML file is automatically created using the picture, comment, and position information associated by ID for every piece of related information, such as questions and replies, and this is displayed on GoogleMaps and GoogleEarth.

3.3.4. Presenting Information

It is possible to choose GoogleMaps(Figure5 left) and GoogleEarth(Figure5 right) arbitrarily so that position information can be displayed in 2D or 3D space. In order to incorporate and display GoogleEarth in a Web screen, a plug-in is installed beforehand. Figure4 shows the example which is referring to PIN information by the function of Q&A.

3.3.5. Tables and database fields

Regarding KML files, Q&A, and the Encyclopedia, the following DB composition was considered.

running number, ID, latitude, longitude, land survey system (KML_mode), title, comment, url, name of picture, number of hits, IP address

3.4. SYSTEM EVALUATION

This system is under development now and is currently in the test stage. It is due to open to the general public in April, 2007. The opinions from the current system users are summarized in the following.

- It is interesting that position information, and a comment and picture information can be summarized.



Figure 3. Input of position information, comment and image



Figure 4. Referring to PIN information by the function of Q&A,



Figure 5. Presenting information (left: GoogleMap, right: GoogleEarth)

- It is good for users to be able to choose a menu according to the subject of their interest, such as Q&A, encyclopedia, and community.
- The procedure of registration is complicated.

4. Conclusion and Future Subjects

This research considered position information and described the construction of an environmental knowledge website of the dynamic user participation type that can collect and send information, and that allows discussion about ecology, the environment, and sustainability. By perusing the distribution of the knowledge using position information on a 2D map and a 3D virtual space, an environmental knowledge web which can grasp spatial distribution was built. We want to evaluate the system through full-scale employment and we still recommend final improvements be made during a test stage.

As a future subject, the utilization of PIN information by the community function should be investigated since such a feature is currently not available. Next, a cellular phone with a GPS function can be considered as a device which can input position information, photographs, and comments easily. We want to reconsider the procedure so that complicated information registration and the updating method can be simplified, as requested in the user comments.

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