Development of an earth environmental digital library system for soil and land-atmospheric data

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ABSTRACT

We propose and examine new methods for automatic data loading system and flexible user interface system with many features such as 3D visualization. We implement the earth environmental digital library and operate it on the Web. Though our system is focusing the limited users like earth environmental researchers, more than 8000 hits per month describe the practical usefulness of it.

General Terms

Experimentation.

Keywords

Digital Library, VRML, User Interface

1. Introduction

As more people recognize the importance earth environment, the needs for earth environmental data such as remote sensed data are also increasing. However due to so many variety of data types and formats, most of researches who are not computer specialists face difficulty to utilize them. Actually they have to convert the original data so that their application program can run with them. As the result, most of those potentially useful earth environmental data is left unexplored. It is obvious that we need an integrated library for earth environmental data with unified interface. Then exist web-based repositories for earth environmental data. However, we identify the following two problems. The first is the lack of useful data in the digital library. This problem comes actually from the lack of data loading tool. The second one is the lack of user-friendly interface since most systems still depend on primitive means such as ftp and gopher. In our research, we propose and examine efficient methods in the following two components that are essential for building practical earth environment digital library: 1) The development of data loading tool that can deal with various formats of soil and land-atmospheric data. 2) The development of user interface that allows easy retrieval of earth environmental data.

2. Data Loading Tool

We develop methods to effectively load various data into digital library using automatic recognition of the earth environmental data. Our method utilized the characteristics of earth environment data such as soil data or land-atmospheric data to recognize the data with 9 steps. We use data loading tool for experiment to recognize formats and to extract attributes from about 600 types of observation data and about 500 types of calculation data. Those

datasets are consisted of about 30,000 files, when compressed they reach 20GB in total. There are also a wide variety of data formats and spatio-temporal resolutions. Our proposed tool targets earth environmental data such as soil and land-atmosphere. With this limited scope, our automatic loading tool has achieved practical level recognition ratio (about 80% of data format recognition and 70% of location recognition). The complexity will increase if we expand the domain. This expansion will be our future work.

3. Interface

We propose an search interface that allows switching easily between multiple conditions. Using this interface, we can enhance the search conditions continuously while interactively confirming the search results. To prove the effectiveness of our interface, we discuss the development of this interface with researchers from earth environmental field to implement interface on the Web that allows combination of following search conditions: Search based on contents, location, and time as shown in Fig.1. The search results are shown at the top-left window as thumbnails. When there are many results, images are automatically scaled down so that all images fit into the result window. Researchers can view all results at once and help them figure out the outcomes. The images can be viewed in 3D by using VRML. The search results are positioned in the virtual space and user can walk through the results while viewing the results in any angle or distance (Fig.2). Our interface provides users with easy and flexible way to brows earth environmental data.
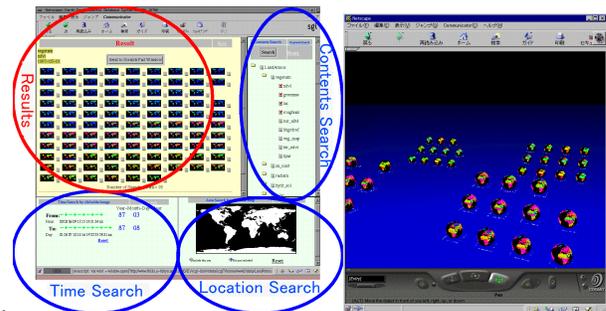

Fig. 1 Search IF with 3 conditions   Fig. 2 Result Widow with VRML

4. Conclusion

Our digital library system is also available to public. Although the scope of users is limited to researchers from earth environment engineering field, the system has recorded more than 10000-accessed monthly that proves the practical use of our system. Users also access various kind of data that shows the high need for earth environmental data in many fields.