Promotion of Web GIS for University Courses and Research

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Abstract

In recent years, GIS techniques have been used by many departments of in the Taiwan Feng-Chia University, because professors and students who come from different departments are in need of a diverse variety types for their research. The Feng-Chia University has invested considerable resources to establish a robust GIS database with web-based management system to query and manage the data. This system is called the E-design Management System and it provides extraordinary of functionality to query data using and any criteria of keywords or spatial boundaries. As the GIS database has over one thousand map layers obtained from many governments, users can easily acquire the required GIS data and integrate it with their course development and research.

Introduction

The government proposes to invest a heavy sum of nearly 50 billion in the coming 6 years towards the development of e-governance systems due to the need to train technical staff related to e-government activities. Besides, there is an imminent need to update the academic syllabi and the teaching methodologies to keep pace with the information revolution and to enhance the ability of the student community.

This study aims to establish a complete platform for e-learning and e-teaching, which constitutes a data-sharing mechanism and integrates multiple disciplines for reuse among other courses. This platform integrates the achievements of all the projects for new teaching materials and the participating students can learn more theories and practices from these projects.

Goals

The goals of this study are as follows:

- Boosting the fundamental tools of teaching and research,
- Enhancing and evolving the quality and quantity of teaching and research,
- Integration of multiple disciplines and promote multidisciplinary research,

System Design

The e-learning platform, E-Design Management System, is a web-based framework that contains digital learning and spatial data-warehouse. The former focuses not only on the communication between the platform and courses, but also deals with the communication between students and teachers. The latter primarily offers geospatial-information by way of online GIS schema. This paper focuses on the spatial data warehousing system, whose characteristics are as follows:

1. The development of GUI

   The Graphic user interface is very popular in current OS due to its inherent characteristics such as easy of use and flexibility. Users can use the GUI to master the system operations in no time and can query the system for advanced applications.

2. The use of client script language

   Java script is employed to develop the Internet GIS systems, since it is a standard programming language used in the development of networks that can effectively reduce the load of Web GIS server.

3. The platform of internet GIS

   Internet GIS is a practical and efficient way to transfer and/or share geo-information over the networks. In this study, the ArcIMS software is utilized to implement the Internet GIS system.

4. The architecture of the system environment

Figure 1 illustrates the system architecture. The MS SQL server database is used in the system, which can be accessed by ArcIMS through the spatial data engine, ArcSDE. Several spatial servers are employed to reduce the load on the Web GIS server, thereby improving the system performance.

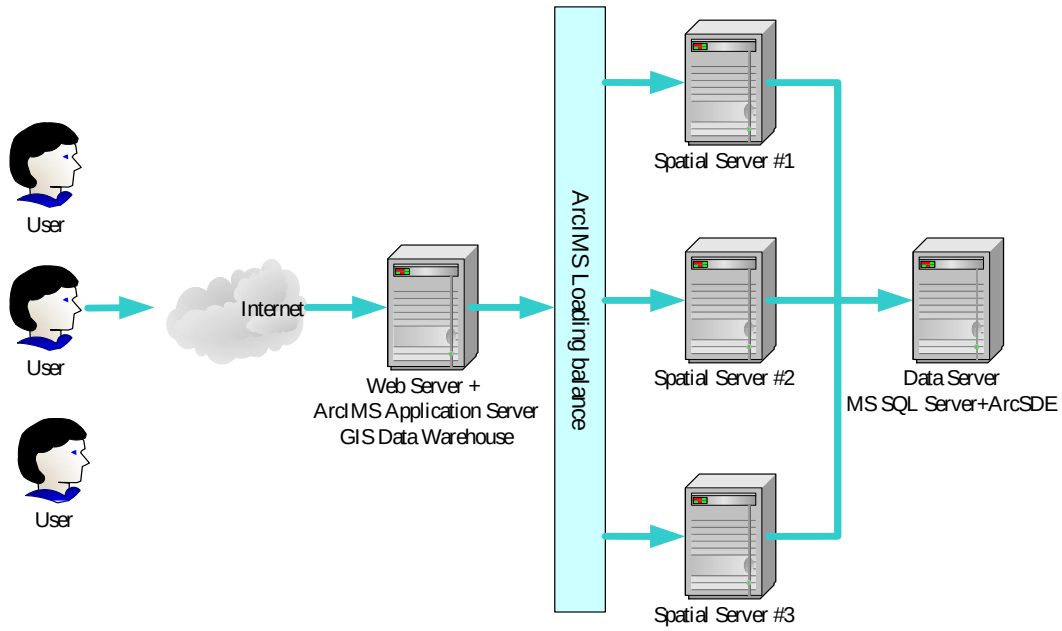

Fig. 1 Architecture of Web GIS system

Figure 2 illustrates the flow chart depicting data download from the Web GIS server. In order to ensure data-security, the letter of authorization should be keyed in. In this manner, the statistical analysis for downloading records can be done for decision-making analysis.

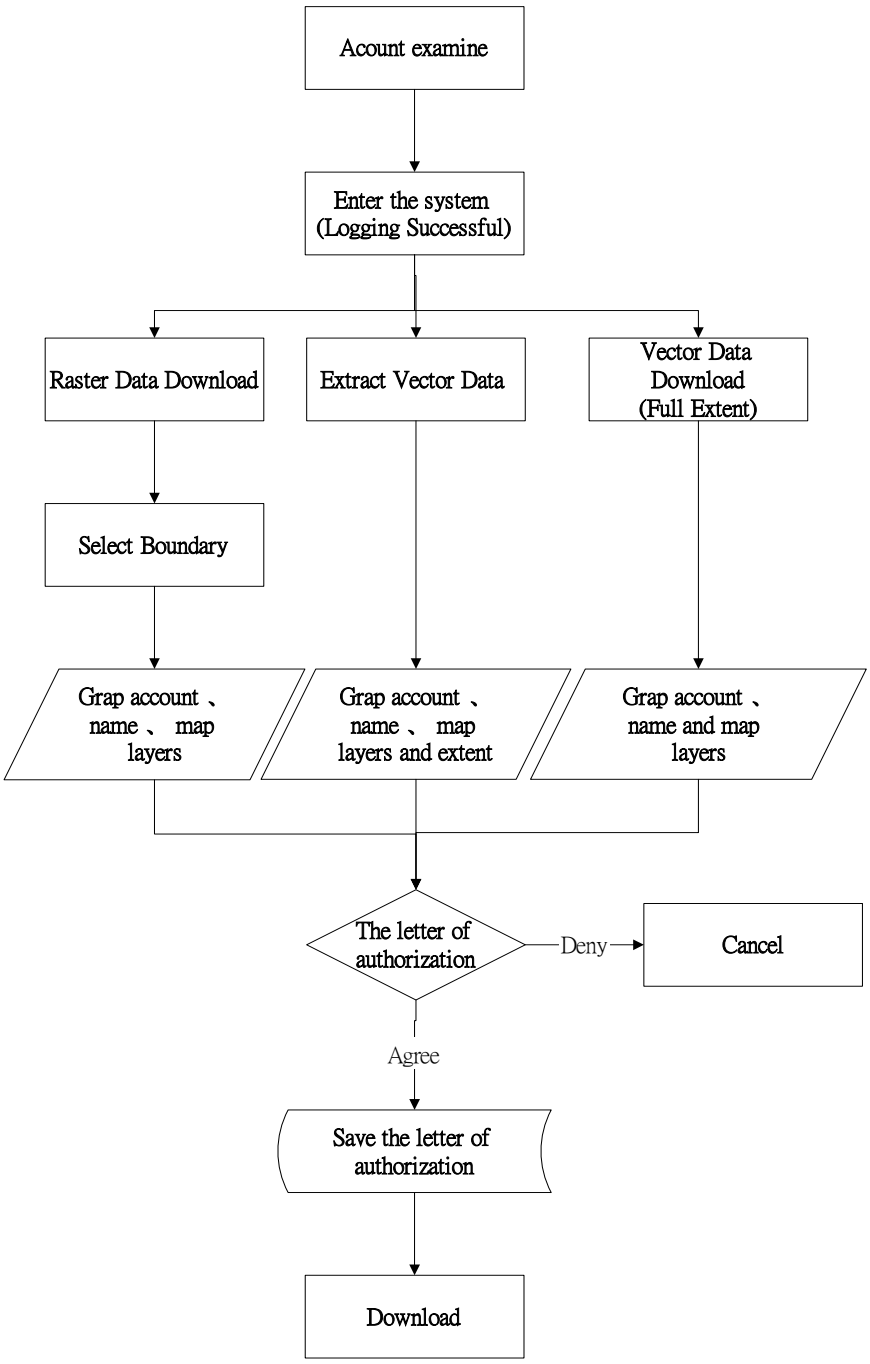

Fig.2 The flow chart of downloading data from Web GIS server

CRM Analysis

Customer Relationship Management (CRM) is employed in this data management system to facilitate easier understanding of the system users and faculty. Based on the analysis of a user's habits by CRM, this system can serve as a spatial

data warehouse to improve the search mechanism and the system can also offer customized service and a user-friendly interface. For example, when a user searches some layers, the results can be ordered according to the search frequency to save search time. The functionalities of the data management system are shown in Figure 3.

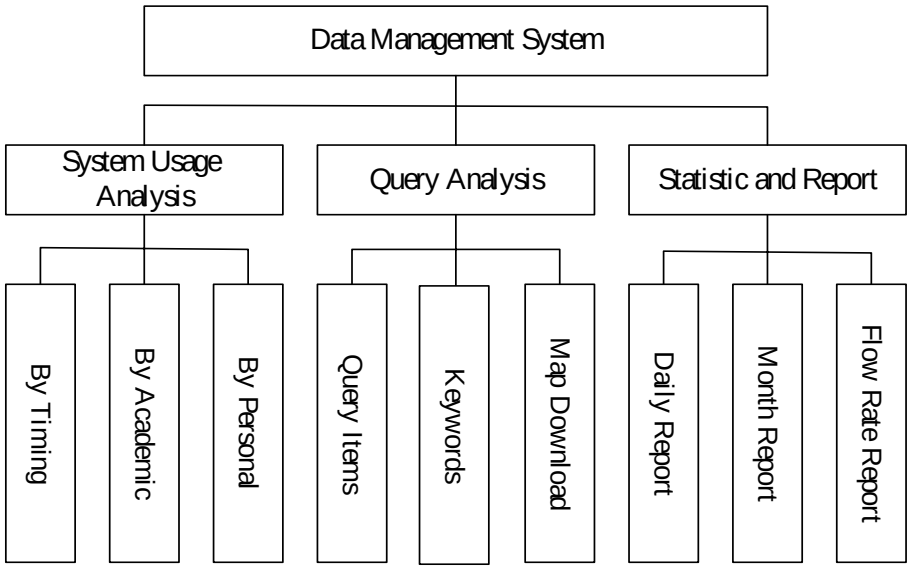

Fig. 3 The functionalities of data management system

The operational records containing the user log-in/log-out information can serve as an important reference to follow-up efficiency analysis and report on system enhancement. Figure 4 illustrates the current scheme of the CRM database.

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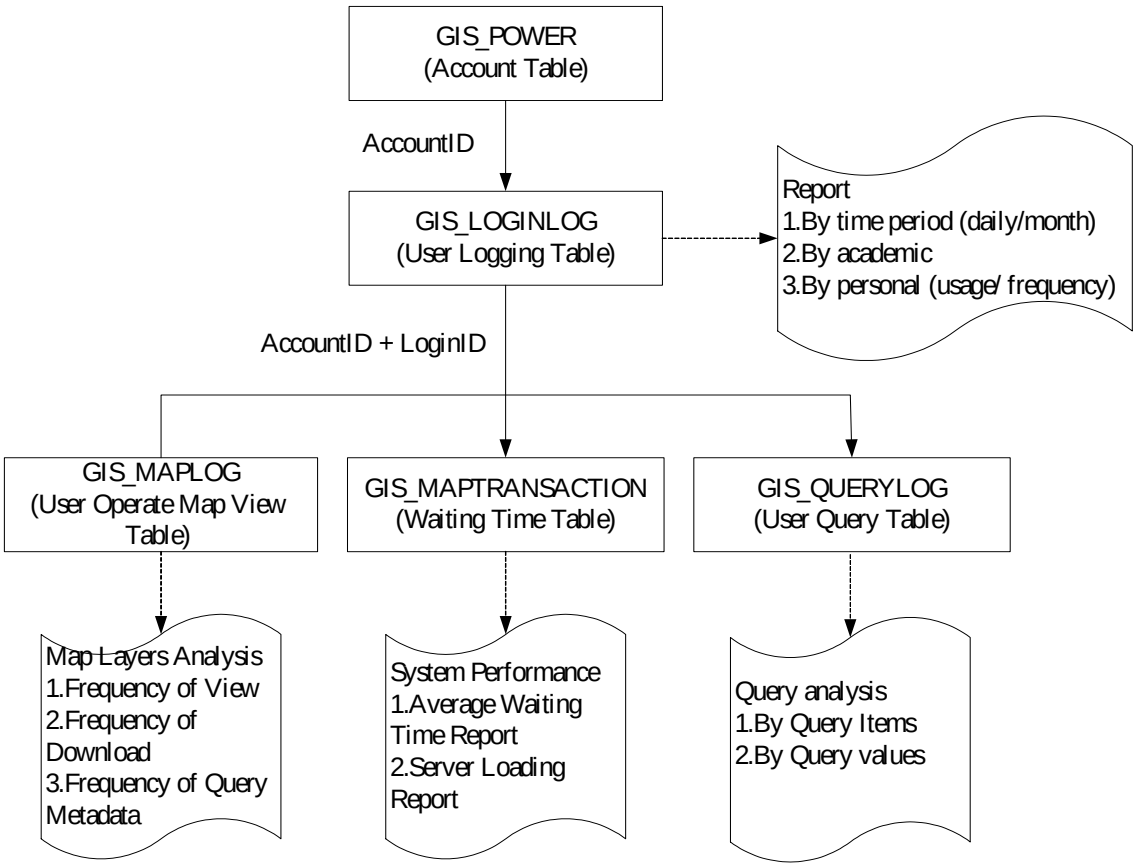

Fig. 4 Database structure of data management system

The system records each user's log-in time and the serial number during system log-in; similarly, it also automatically records user's log-out time to facilitate analysis of usage durations and user habits. The users' logging information stored in the logging table can later be analyzed in the form of chronological, individual or academic reports.

The user operational processes, including the idle time and query syntax are also automatically recorded. The recorded information can be analyzed to generate useful reports for the purpose of operational management while using spatial data warehouse. Figure 5 illustrates the analyzed results of the system, including map query, the setting of query criteria, CRM reports, map previewing and overlaying, and metadata query.

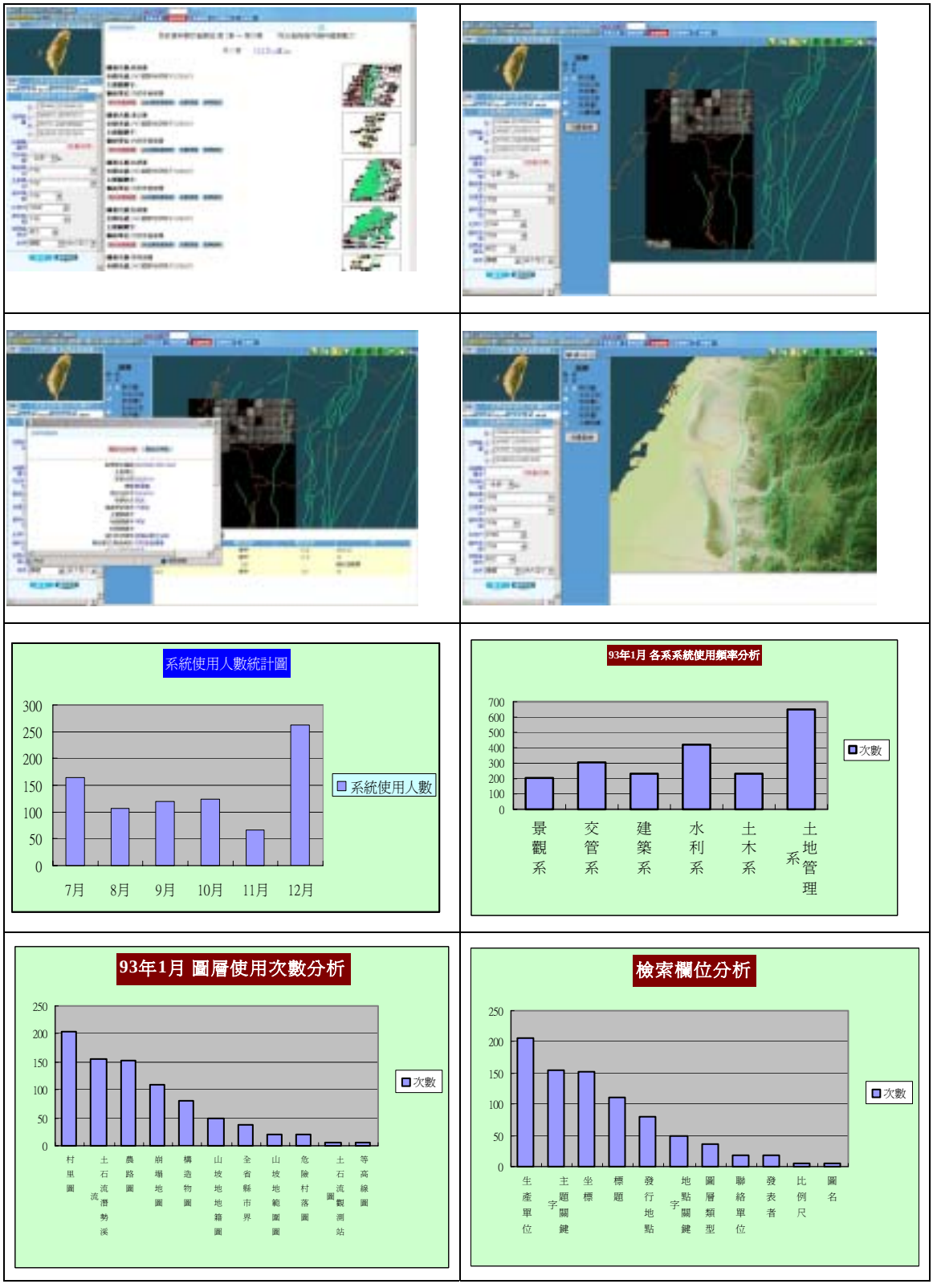

Fig. 5 The analyzed results of the system

Conclusion

The aforementioned system provides powerful functionalities for teaching and learning, thus facilitating a thorough integration of multidisciplinary, teaching-related resources. This not only enhances teaching qualitatively and quantitatively, but also fulfils the goal of data sharing and reusing via the e-design platform.

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