

Facility Management Techniques Using Internet GIS and Decision Support System

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Abstract

The goal of this research is to develop the method of facility management that is used to manage the facility efficiently by using existing analyses of the system and operation. Because the standard of accuracy in spatial analysis and calculation is an unclear, the exact analysis of geographic data for a decision-making needs statistical analysis and administrator-centered type of system didn't satisfy the desire of users. There must be the existing general statistics module, integrated Internet GIS and the composition of interface in order to structure a spatial statistics analysis methods that satisfy the matters desired in internet GIS into the spatial analysis function. This paper presents the need of Internet in supporting and managing function of all facilities in campus and introduces the possibility of applying.

Introduction

Thanks to the development of GIS Technique, modern society is fast developing that much easier predictions on real world can be possible by database needed to solve many problems-from human-facing big ones such as society, economy, culture, environment to small ones like gas pipe, electricity pipe, water supply pipe, sewerage pipe management or school facilities. Since previous facilities management system was based on managing original map and attribute data separately, it's been very inefficient. In addition, despite the need of sorting and preserving the design map and data of construction, there're not enough

space and good management, which has led to the loss of data, also making it hard to manage facilities effectively. Because of the separate management and network of previous data, it was inevitable to do the same work and wait for a long time before doing the job. This was a considerably ineffective system timely or economically. Previous study did only process and print data, which was meaningless. It was necessary that supporting-information for decision making could analyze, unify, and print previous data graphically so that it helps decision makers understand every situations and then take an action. Also, although space-analysis and calculation supported these processing of information, standard of accuracy was not clear and supported just simple level printing. So there wasn't any statistical space analysis. And not only managers but also users of facilities felt uncomfortable and tended to wonder. The reasons and details whenever using them. However, previous manager-inclined system tried to improve this and meet user's needs only to fail. The goal of this research is to establish the base of information unit by sharing information with relation organization, being scientific of facility management, and build network system to prevent investment of construction descriptive method which depends on experience or intuition, so that we intend to give consistent and precise regulation as far as possible. In the research observed in information sharing aspect, it used the internet in printing final system, and realized raster Web GIS and 2-Tier structured model from internet GIS technical tendency. As the campus is large and complicated with facilities containing enormous man-power, material and formless property, so this research is intended to suggest the need of GIS in decision-making, supporting and managing function of all facilities in campus.

Internet GIS

Internet is a global network of computers connected through communication devices to one another. It is a means for GIS users to exchange GIS data, conduct GIS analysis and present GIS output. Therefore, Internet GIS is a special GIS tool that uses Internet as a means to access and transmit remote data, conduct analysis and make GIS presentation. At first, Internet and GIS advanced in independent fields. GIS installed and independent systems and addition devices with database established in local, whereas, Internet publicized multimedia-centered Internet information service thanks to the rapid growth of network which is and instrument of information-communication. So far the publication of WEB has shown the possibility that high costs aren't necessary for data process while sharing the data previously established in the active areas of SIG. It is realizing GIS in dispersion environment through network. Internet GIS is a system to exchange space data through Internet and to analyze, process the space data by a remote control. Internet GIS has been developed separately in data format and under client/server

environment. Information-supply in data format is divided into raster and vector data again. Information supply of raster data is a sever-centered service making client display mainly, that of vector data which not only servers but also clients are able to process geo-space data. This means proper a part division is possible in both sides. Since normal browsers like Netscape or Explorer don't support geo-spatial data, vector browser is needed which supports formats of vector data. The main function of way of data offer under the client/server environment is to store, manage geo-spatial data, and provide service. Multi-user-process, display of geo-spatial data, and user interface are also possible. Figure 2 shows relations on Internet GIS method under client/server environment. The concept of client/server involves splitting an application into tasks between the server and client. A client/server application has three components: a client, a server, and a network (Hall, 1994). Each of them is supported by specific software and hardware. The client sends a request to the server, which processes the request and returns the result to the client, the client then manipulates the data and/or results and presents to the user. The connections between the client and server are established according to a communication protocol such as a TCP/IP. Internet GIS applies the client/server concept in performing GIS analysis tasks. It breaks down the task into server side and client side. The client can request for data, analysis tools or modules from the server. The server either performs the job itself and sends the results back to the client through the network, or sends the data and analysis tools to the client for use on the client side.

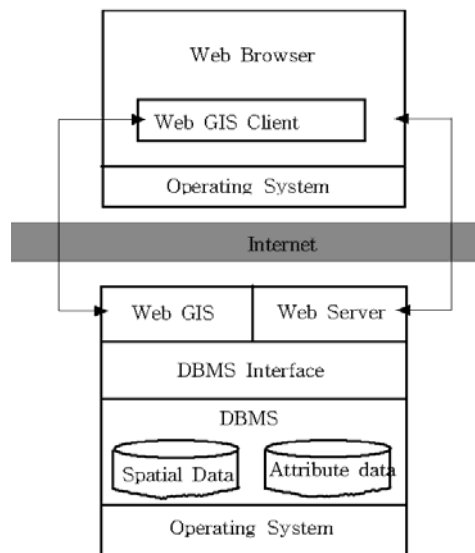


Figure 1. Concept of Internet GIS

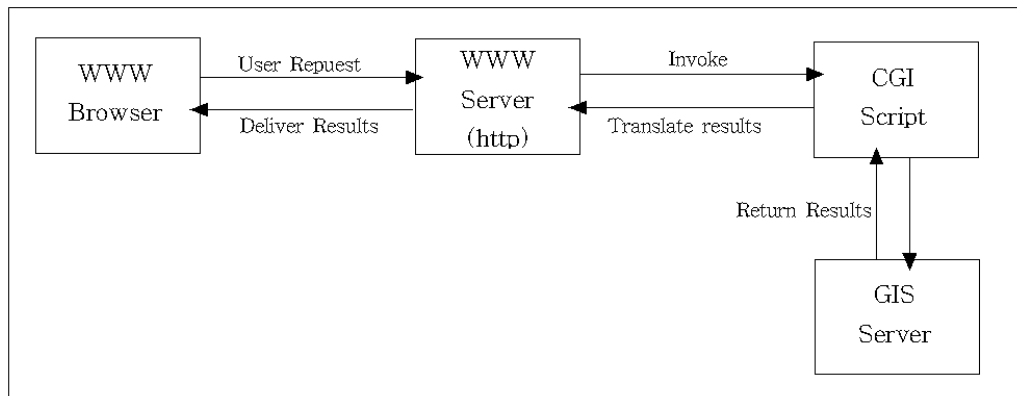


Figure 2. Work process of CGI-Based Internet GIS

Study areas

Areas subjected to study needs to complex facilities structure in certain boundaries. So, the most appropriate facilities selection in PNU (Pusan National University in Korea) and decision-making model is used on facilities management method. Figure 3 indicates the building status and road status realized on ArcView.

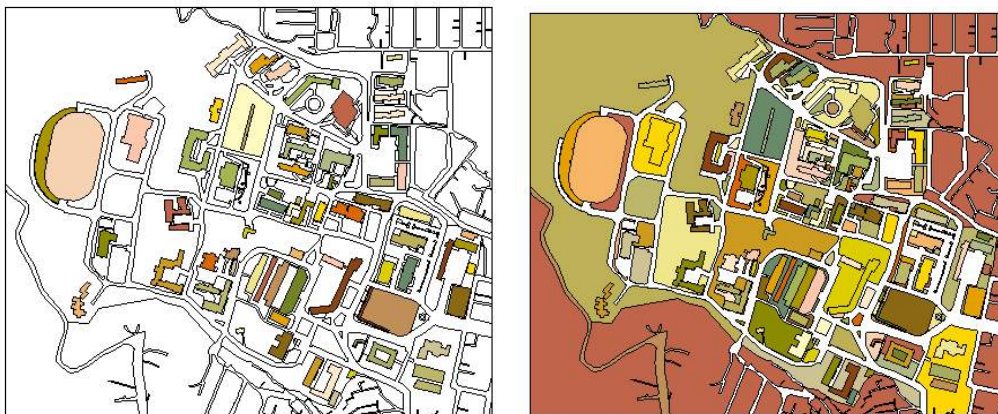


Figure 3. Building map and road map in study area.

Database Foundation and Design

In Internet GIS realization, much time and expenses are used in building up database. This kind of database structure consists of connection between map factors and property factors, layer structure of geometrical information, and subsequent concepts of space map. This concept must be used in developing

GIS application programs. For the fundamental of database, 1:1,000 digital map, building map, and 1:600 underground map are used where PNU is located. For six months, quality of compound underground, length, and depth have been studied and mapped with these information, rough space layer is made up of thirteen parts. Property information managed being separated into buildings, laboratories, equipment and office tools, nine buried cables, and road. Image files on building, equipment, and office tools are accompanied for users. Property information on buildings and laboratories are database on the basis of previous data. Roads, underground facilities, facilities property information is newly added. The process of database foundation is showed on figure 4.

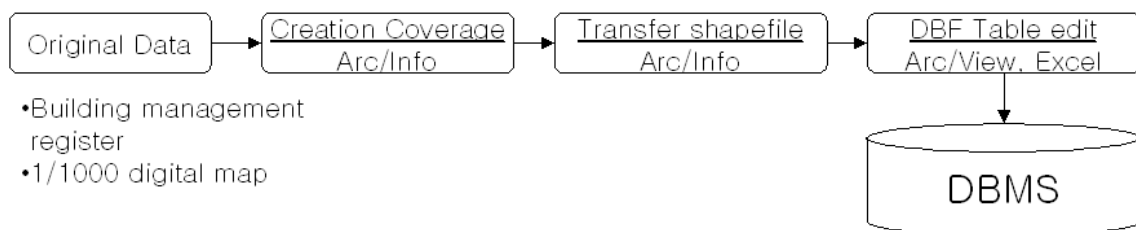


Figure 4. How to Build Database

Programs and module used in study

The hardware's used in this system are Pentium 3 633PC, Scanner, Plotter and AutoCAD, Arc/Info, Microstation SE, IRAS/B, GEOVEC are used in building up database. Oracle 8i is used as database server, application development visual basic 6.0 and Map Object 2.0, Internet base application Asp and Microsoft Visual InterViewDer 6.0, Map sever Map Object IMS.

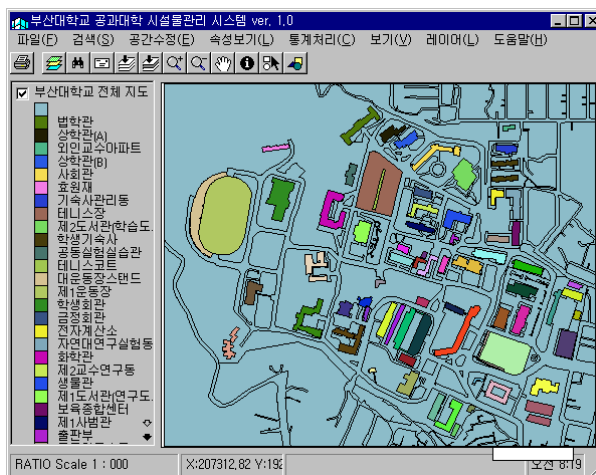


Figure 5. Main Window in Facility Management.



Figure 6. Control Layer

Facility Management System Realization

Facility management system supports decision-making by carrying out through questioning as well as inputting, outputting data and modification. The outcome of facility management system in this study is like figure 5. Figure 6 is the layer window of facility management system and figure 7, 8 is the one showing laboratory and building properties.

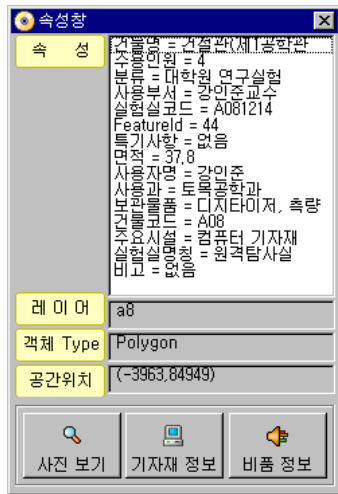


Figure 7. Attribute Window of Lab.

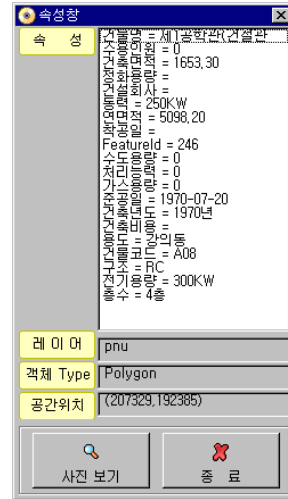


Figure 8. Attribute Window of Building.

Facility Management System Realized by Internet GIS.

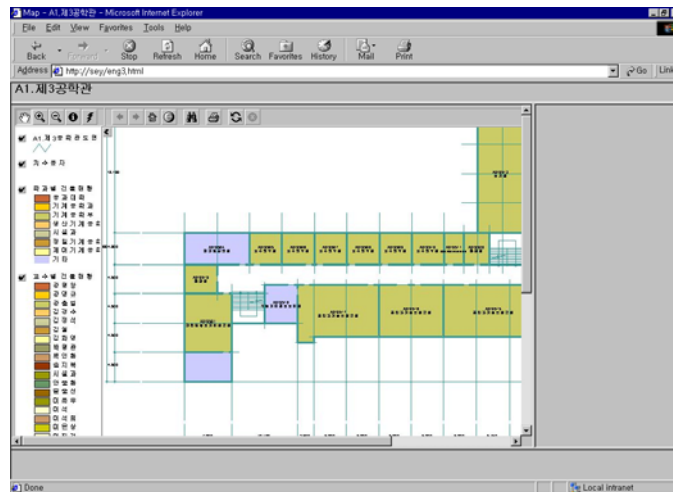


Figure 9. Space Management System in Internet.

Figure 9 is the first screen of compound-space management system realized on the Internet. Since the program design in this study used Map Sever that the program designs GIS S/W, it is not independent to

platform. In data format, it supports later service and the client/server structure is built in 2-Tier method. Generally speaking, Web programming is realized using JAVA, which is a so-called standard language on the Internet. This study, however, it is said as a server and ASP is used to realize normal web database programming. Also, it is made sure that map-related control service is dealt with on Map Server. University-facility-management system on the managers to communicate directly and to reduce the frequency of rework by posting work status of facility extension, building repairing on the net so that the process can be known through the Internet.

Conclusion

This study is on facility management techniques using Internet GIS and decision support system. Developing GIS applications for the Internet is a situation where the best solution depends on the application requirements. By carefully analyzing requirements and planning an Internet GIS application, a software developer can greatly simplify the development process. The first step a developer must accomplish is to gain a thorough understanding of the application requirements. An understanding of the application requirements will allow the developer to make the right architectural choice for the application. Typically a server-side application is a good choice for developing an Internet GIS application because of advantages that include ease of development and standardization. After applying geometrical information system on facility data, following conclusion has been obtained. Unlike the previous method, which depends on subjective opinion on subjective opinion or experience of analyzer and expert from the printed data, this one made it possible to draw a reasonable decision-making by using objective decision-making model. When searching for a huge amount of information, time-consuming administration works indispensable in the past. Now, it is far more reduced by sharing the input and changing simultaneously. Thanks to the bulletin board on the Internet, prompt reactions on suggestion, facilities-related problem solution are possible. In addition, when modification was needed, modifying authorities were given to each department so that changing data and sharing the information situations, presently managed, on the Internet could be done. Previous studies had been dealing with the speed problem of GIS data process under Internet environment and system studies on system foundation and management methods under the environment that feature modification on the network is possible should be carried out.

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