도시 배수관리 시스템 디자인*

Zhang Yuan, 이명수, 조윤호, 이상근
고려대학교 정보통신대학 컴퓨터통신공학부
e-mail : {zhangyuan, lms9711, cloudjo21, yalphy}@korea.ac.kr

Design of an Urban Drainpipe Management System

Zhang Yuan, Myong-Soo Lee, Yoon-Ho Cho, SangKeun Lee
Division of Computer and Communication Engineering, Korea University

Abstract

In this paper, we discuss the design of an urban drainpipe system based on Geographic Information System (GIS). First we introduce the reasons why we establish this system, and then analyzed the construction, database architecture, network architecture of the system, at last we give a develop direction in the future.

1. Introduction

With the rapid development of urban construction, the protection of water environment is more and more important. The rainwater and sewage treatments have been gradually completed. But it brings plentiful data of drainpipe network. It's difficult to manage the data by handwork method. Thus, it is necessary for modernization city to establish a perfect, exact drainpipe network management system to enhance manage efficiency and quality of drainpipe network. But different form general data, drainpipe data has its' own characteristics, like it is underground, usually with lots of spatial information (e.g., map, graphic, coordinate, etc.), so it's hard to use traditional methods to treat with drainpipe data [2][4].

GIS is a system an information system for capturing, storing, analyzing, managing and presenting data which is spatially referenced. In a more generic sense, GIS applications are tools that allow users to create interactive queries (user created searches), analyze spatial information, edit data, maps, and present the results of all these operations [1]. And it also can be data-exchange-flat of other information management systems, such as network modeling system, water quality monitoring system, and so on. In respect that GIS holds a powerful function in handing in spatial data, we expect GIS would be an effective tool to urban drainage network management [3][5].

2. System Design

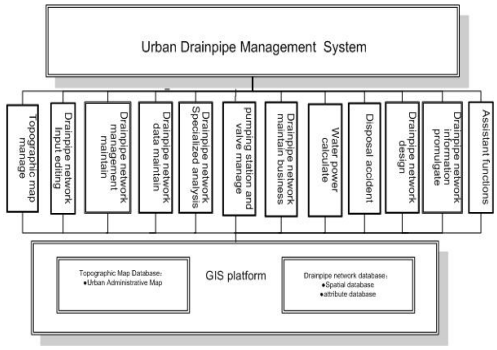
In our consideration, we adopt urban topographic map as the background of the system, take drainpipe network spatial data and the attribute data as the core, using computer technology, GIS technology, data base technology, image processing technology, network communication as well as the multimedia technologies, then propose a constructation of system that suite the requirement of urban drainpipe management.

2.1 Design Fundamental

Our goal is develop a system that could manage drainpipe resource efficiently and convenient for supervisors to adminster.Thus, the system should including the basic functions of GIS (e.g., transform of data format; graphic management; data retrieval, etc.) and also has the abilities to create chart, special spatial analyze functions that fulfils the requirement of practical work. Meanwhile, as an informational management tool, it must have the characteristic of common software tools (e.g., compatibility, expansibility, etc.).

2.2 System Construction Design

We analyzed the requirement of urban drainpipe management, and then plan a specific construction for the system; it is included 14 parts with 14 different functions and run above the GIS platform. In our design, we use MapGIS as our platform. The construction of the system is shown in Figure1.

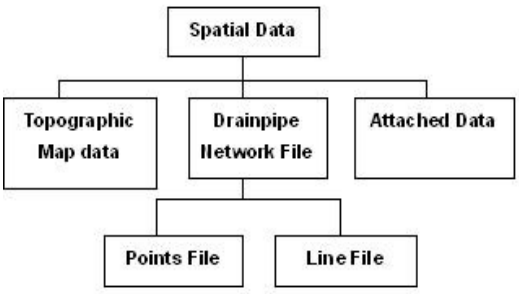


(Figure1) Construction of the System

* 이 연구에 참여한 연구자(의 일부)는 '2 단계 BK21' 의 지원비를 받았음

2.3 Database Design

The data that we handled could be cataloged into two layers: one is drainpipe network project and the other is that the data contained in drainpipe network project. The most core data is spatial data, graphic data, topology data and attribute data of drainpipe network. A drainpipe network project is organized by various types of data which originate from different source. And it contains all the data types which we need to manage. When we design the database architecture, we divided all the data into two parts: Spatial Data and Attribute Data. We use GIS platform software to manage the Spatial Data while we use traditional database software (e.g. SQL Server, Oracle, etc.). Figure2 shows the data structure of spatial database.



(Figure2) Structure of Spatial Database

The data stored in arribute database is not involve to graphic, thus to manage this data we just adopt tranditional method.

2.4 Network Design

In our consideration, we establish two servers for the system. One is Database Server that supplying data service, consumers use C/S mode to maintain and updating data. The other is Web Sever that consumers use B/S mode to query data through internet. The network architecture is shown in Figure3.

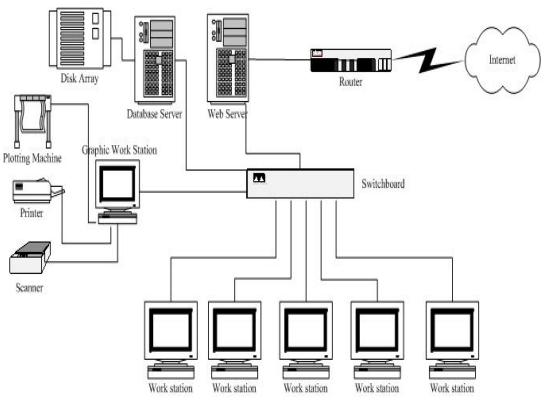
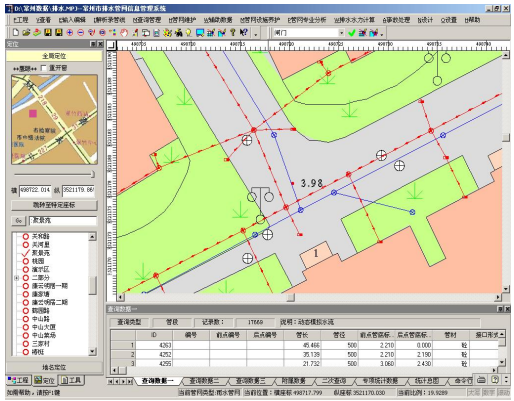


Figure3 system architecture design

2.5 Results

Based on the methods mentioned above, we developed our system. This system is combined traditional programming, database, image progressing, communication technologies with GIS, achieved GIS graphic intuitionistic display and drainpipe network resource management. The system is shown in Figure4.



(Figure4) Drainpipe Management System

3. Conclusion and Future Work

In this paper, we present the necessity for establishing a drainpipe network management system; introduce the basic method to design the system, give architecture of system, database and network, and then we show our design.

In the future, we want to enrich our system by using three-dimensional dynamic visualization technology to enhance the display effects of GIS data, and also should develop WebGIS which is the trend of development of GIS technology.

Reference

[1]http://en.wikipedia.org/wiki/Geographic_information_system.

[2] S. Saegrov and W. Schilling. Computer-aided rehabilitation of sewer and storm water network (CARE-S). In *Proceeding of the International Conference on Urban Drainage*, pages 23-25, 2004

[3] J. D. Wilson. GIS convergence creating the next-generation GIS. *GIS WORLD*, pages 36-39, 1996

[4] F.C Gonzalez and F.D.F Delgado. Managing anomalies and austomer care with a GIS. *Water Supply-Review Journal of the International Water Association Torino*, 18(4):62-76, 2000

[5] C. M. Burt and R. E. Walker. GIS utilization for analysis of district drainage water recycling. In *Proceedings of the National Conference on Irrigation and Drainage Engineering*, pages 149-156, 1993