

THE DESIGN AND REALIZATION OF THE SPATIAL DATABASE FOR EMERGENCY EARTHQUAKE DAMAGE ASSESSMENT BASED ON RS AND GIS

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1. INTRODUCTION

While an earthquake occurs especially in depressed areas or mountainous regions, the survey of damage loss becomes arduous because of chaos and awful communication condition. A solution is proposed that using RS (Remote Sensing) and GIS (Geographic Information System) techniques assesses seismic damage loss for emergency, which need establish a spatial database to store the necessary data. In this paper, the design of the spatial database is introduced. The database depended upon RDBMS (Relational Database Management System) and SDE (Spatial Data Engine), including images, vector files and tables which are sorted by types and organized by every earthquake events, divides into several sub-databases. According to the integrated database and its management system, emergency earthquake damage assessment could be realized. The constructive work provides much faster response and data service and is even more economical to a certain extent. A similar spatial database has been deployed at national commanding center for earthquake emergency response of China.

2. DATABASE DESIGN

2.1. Database Logical Structure

Spatial data contain grid and vector generally. Some GIS data as statistical diameters aid for extracting information from images. For different measures, they should be points or polygons in a large scale associated to a country's administrative divisions. The earthquake damage assessment based on RS and GIS is to extract damage information from images received after earthquake, and then the information is transformed to quantified index that is used to evaluate economy and people loss with practical social and economic data finally [1]. Therefore, the database not only stores calamity images and vector files, but involves all kinds of images processing results and application models and calculation parameter tables etc. The figure 1 below displays the spatial database structure.

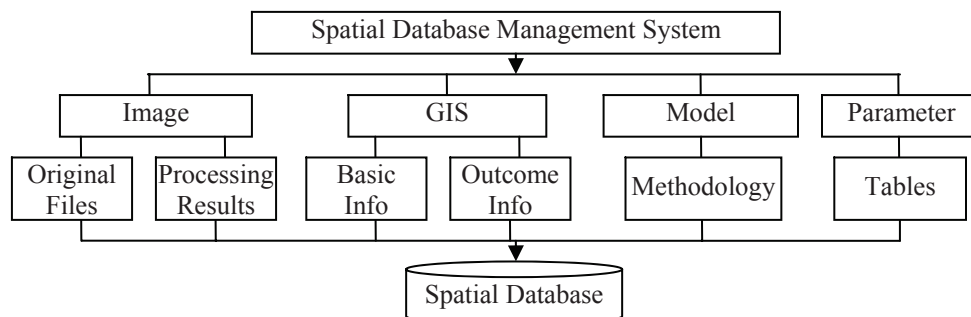


FIGURE 1 SPATIAL DATABASE STRUCTURE

2.2. Database Realization

The database builds on oracle, each sub-database of which is stored separately in one oracle tablespace, so that data would be allocated on different physical memory. Spatial data access relies on middleware SDE. Database management system is developed under Microsoft .Net environment; otherwise PL/SQL language could also accomplish and modify the database system.

In SDE storage rules, spatial data could be regard as files stored in database when accessed from client. Images and vector files have attribute tables to record their metadata and other information. Records and files are related by a pre-defined

code system, so the one-to-one relation is the key point for database searching and maintenance. The database frame is showed in below Figure.

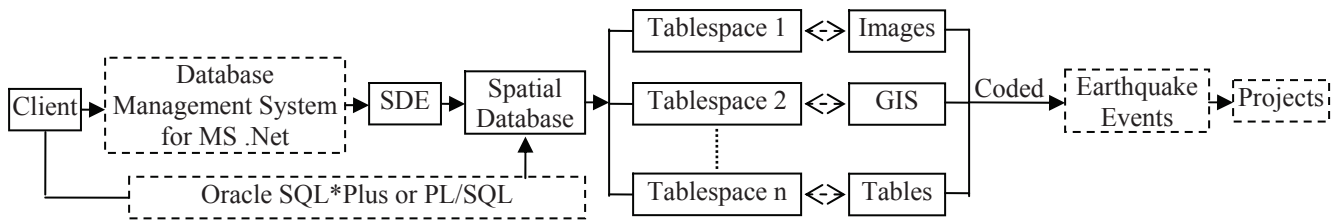


FIGURE 2 SPATAIL DATABASE REALIZATIONS

A concept *project* appeared in Figure 2 is to manage course of loss assessment experiments within large amounts of images. It is a comprehensive logical subject about how to achieve an assessment task, which is supposed to consist of images, models and methods.

2.3. Assessment Data Flow

In Figure 3, earthquake damage loss assessment data flow is described. Tables' structures are defined in data dictionary that describes field's name, type and constraint. The whole database supports the means of emergency assessment based on RS and GIS, and it is a historical earthquakes data management system as well.

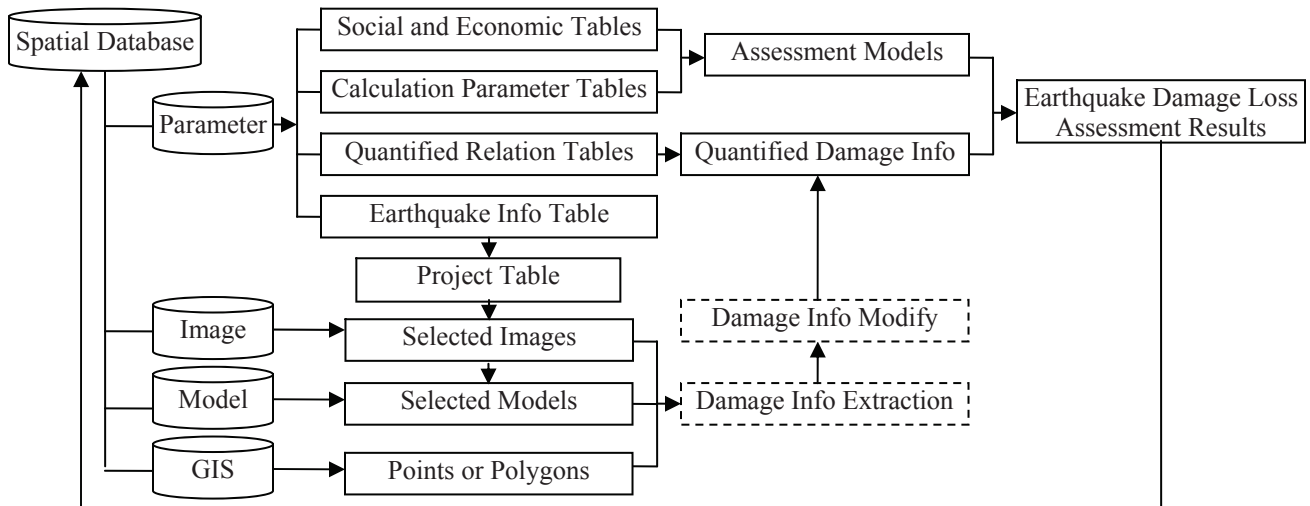


FIGURE 3 DAMAGE ASSESSMENT DATA FLOW

3. DATABASE MANAGEMENT

The spatial database has different data management functions for its different types of data. The primary data formats are supported, such as ERSI SHAPEFILE, COVERAGE, ERDAS IMAGE, GEOTIFF etc. To do the assessment much speedier and more accurate, daily maintenance and data update are of importance. When earthquake happens, database supplies resources to display the disaster region background and distill useful vector data before receiving the RS images. The database management system also owns user certification function that guarantees the data security.

4. CONCLUSION

The spatial database above is established for assess earthquake damage loss. For based on RS and GIS, it is to store and manage mass data and could be applied in emergency period. The database is made up of 4 basic parts, and data is organized under regulation of spatial database design principle besides management of normal tables. A code system is used to keep the uniqueness in both spatial data and table records. Because the database has data management functions, extendibility and experimental mechanism, it could be applied to RS data's management and scientific research of seismic damage.

[1] Long Wang, Xiaoqing Wang, and Xiang Ding, "Study on Construction Seismic Loss Assessment Using RS and GIS", IEEE IGARSS 2007, Barcelona Spain, 23-27, July 2007.