STUDY ON A PRACTICAL EARTHQUAKE DAMAGE ANALYSIS AND PROCESSING SYSTEM BASED ON RS AND GIS

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1. INTRODUCTION

The Earthquake Damage Analysis and Processing System based on RS and GIS (RSEDAPS) is practical software system developed specially for the post-earthquake emergency disaster monitoring and assessment during from 2006 to 2008. The system has been deployed in the national earthquake emergency command center, and partially applied in the action of emergency RS processing of 2008 Sichuan earthquake with magnitude 8.0 which causes total of deaths and missing about 86,000. The paper demonstrates the design objective, the system work modes, the system development and running eviornment, system functions and the primary application in the emergency work of Sichuan earthquake.

2. THE SYSTEM OBJECTIVE

RSEDAPS is designed to integrate the functions of manage the mass RS data, image pre-processing, image enhancement and earthquake damage identification and loss estimation, etc. The system is a special software platform applied practically for the disaster information extraction and service in the earthquake emergency action.

3. THE MODES OF EARTHQUAKE EMERGENCY RS WORKS

For modes is been designed for RS works corresponding to the stage of earthquake disaster reduction:
(1) Mode of fast start of the system and background RS information service of the disaster area immediately after the catastrophe earthquake occurs. The mode will provide quickly the regional RS image, the 3D topographical map, the possible serious disaster area and the acquire requirement of aero or satellite RS images etc. The collection or digitalization of RS image acquired before the event and the possible geographical data are being done also in the mode.
(2) Mode of fast earthquake damage extraction from post-earthquake RS image in the emergency stage. The computer aided earthquake damage extraction will be implemented in the mode. The level and distribution range of damage to earthquake will be determined. The mode should be applied within several hours after the image acquired.
(3) Mode of standard earthquake damage extraction from post-earthquake RS image in the emergency stage. The supervised classification will be applied in the mode for the more precise earthquake damage extraction. The damage and loss distribution will be determined. The mode should be applied within one or several days after the image acquired.
(4) Mode of detailed earthquake damage extraction from post-earthquake RS image after the emergency stage. The detailed damage distribution will be extracted from RS images with the information of field survey. The study will determine the disaster distribution and established more precise quantitative relations between the RS seismic damage index and the field survey ones.

4. THE DEVELOPMENT AND RUNNING ENVIRONMENT

The system is designed to run in the local network environment with GIS database server, WebGIS server, graphical workstations and I/O devices. The software environment will include Oracle 10g, ERDAS Imagine 9, ArcGIS 9 and other image procession and GIS software. The system is developed with the ERDAS Imagine Toolkit and ArcGIS Engine 9.

5. THE MAIN FUNCTIONS OF RSEDAPS

The main functions of RSEDAPS are as followings:
(1) Spatial database management subsystem including management of image, graphical information, DEM, image enhancement model database and the data associated with damage and loss estimation etc.
(2) RS damage assessment data preparation subsystem including the fast RS image serve immediately after earthquake occurs and preparation of data before the post-earthquake damage image acquired.
(3) Image pre-processing subsystem including variety of conventional and special pre-processing methods.
(4) Image enhancement subsystem which includes the conventional and new image enhancement method developed by the authors. The image enhancement model combination technique is also developed by the authors.
(5) Earthquake damage extraction subsystem will finish the earthquake damage extraction from the images with classification modules in different modes mentioned above in different work stages.
(6) Earthquake damage assessment subsystem will determine quantitatively the level and distribution range of earthquake damage.
(7) Loss assessment subsystem will implement the spatial economic loss or death distribution according to the earthquake damage distribution extracted from RS images as well as the population and economic data.
(8) Geographical information subsystem will functioned with geographical information accessing, processing, viewing and outputting et al.
(9) Information release subsystem will issue the main RS image and thematic map etc with WebGIS techniques.
(10) System integrated management.

6. THE APPLICATION CASE OF RSEDAPS

The RSEDAPS is applied partially in the earthquake emergency action of 2008 Sichuan earthquake with magnitude 8.0. The main work are the emergency thematic map creation, mass RS data management, fast earthquake damage extraction and damage estimation etc. The main result will be introduced in the paper.

7. CONCLUSION

The paper introduces RSEDAPS as a successful case in designing and developing and application for earthquake emergency action. The study experience might be used as reference for similar system development and application.