Based On GIS Oil And Gas Field Company Seismic Data Loading Quality Control System Architecture Design

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Abstract

Aim at long-standing problems that data lose, omission and loading errors in seismic data loading and quality control of Oil and Gas Field Company, this paper presents a software oriented system design scheme. This plan structures programming, processes and automation system application framework by architectural design, object oriented function module design and business process design based on GIS according to quality control points. It provides research base and ideas for building of seismic loading quality control and Digital seismic exploration.

Keywords: Oil and Gas Field Company; Seismic Data Loading and Quality Control; GIS; Object-Oriented; Design Scheme

1. Introduction

Seismic data loading and quality control program is used to supply descriptions and illustrative information which are data volume matched and missing in seismic data. It needs to gather relevant paper reports, complete data cleansing, data loading and quality evaluate according to seismic data management standard and is one of the key steps of seismic exploration data processing.

At present, research achievements in this area are still relatively scarce, by the reason of oil and gas exploration data is mass and multiformity, foreign countries first propose the concept of data bank [1] and begin to do standardization development. Currently in London UK, Houston USA, Perth Australia and other places have built regional oil data bank, major oil companies and service companies such as Mobil,

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Elf, Conoco, Agip, Geco/Prakla are also under way to build their own businesses or regional oil data banks, and large-scale seismic data processing technology gets a new breakthrough. In China, seismic exploration digital construction which is focus on integrated management of seismic data [2] has also entered the stage of practical operation, but the professional research process of seismic data loading and quality control is not deep enough. Most oil and gas companies are still dependent on traditional manual loading phase inspection in the early stage processing and analyzing of exploration data. It is badly in need of professional development, bulk operation by systematic and high degree program to improve initial stage processing efficiency of seismic exploration data.

2. Based on GIS system structure design

2.1. System hardware configuration design

In hardware terms, based on the importance and safety requirements of seismic data, system is developed by C/S architecture [3], uses the combination of primary server and backup server and uses multi management control node synchronization operation as the overall control strategy. In the LAN network configuration, system uses Fiber Channel Switch to realize high-speed link between client side and sever side to ensure the efficiency, reliability and security of seismic data management.

System hardware configuration structure is shown in Figure 1.
2.2. System architecture design

In software system research and development, system is under the .NET 4.0 frameworks, uses C# high-level language in Visual Studio 2010 development environment, uses MVC (Modal-View-Controller) pattern to accomplish system interface design, module design and process design, and uses UML (Unified Modelling Language) to realize object-oriented model creative which runs through the requirements and design. It is used Module Programming based on GIS to develop that seismic navigation data display, test area verify and measuring line position relationship. ArcEngine, ArcSDE and ArcMap are used to complete Module Programming. Map service URL reference is used to proceed geographic information exploration services. System architecture design is shown in Figure 2.

3. System function model research and design

According to SEG-Y data format standards [4] and data features, and considering function of seismic data loading and quality control and application requirements, the software is designed to set the function of two-dimensional seismic data processing, three-dimensional seismic data processing, seismic velocity processing, general functions, file system, help system in one data quality control program to complete many specific functions which run though the measurement results quality control, seismic result data quality control, seismic velocity data quality control, navigation and data matching relationship control. These functions include loading quality control points like extraction coordinates, generating navigation files, navigation verification, C card reset, C card information input, CDP checking, way serial number checking, way ID checking, data volume analysis, data volume splitting and merging, putting of way head, seismic profiles showed, way data extraction, speed format conversion [5], data information evaluation,
matching script creative, navigation data checking, seismic data checking [6]. System use case diagram is shown in Figure 3.

Fig. 3. System use case diagram

4. Seismic data processing business process design

On the function process side, seismic data loading and quality control system works before seismic data management system. On business relation side, seismic data loading and quality control system set a standard loading process, and quality control exists in all the stages of the process. Specific is shown in Figure 4.

Fig. 4. Seismic data processing business process
On the software operation process side, user needs authority controlled based on role, then to do corresponding function effectiveness operations. Software sequence diagram as shown in Figure 5.

Fig. 5. Software sequence diagram
5. Conclusions

Oil and Gas Field Company seismic data loading quality control system design based on GIS realizes the research on overall design of seismic data management system loading process and standards. And this system builds a solution based on GIS for seismic data quality control. This paper realizes the Top-level design of the system by analyzing and deploying from several sides that hardware configuration, system architecture, software requirements, function models, quality control points analysis and system operation process.

For the practical application benefit, Oil and Gas Field Company oriented seismic data management system design schema is highly pertinence, seismic data comprehensive display application based on GIS improves the system application efficiency, which has more innovation and practicability than other current seismic data management system developments. It can be realized in application that large quantity, automation and programming seismic data loading and quality control by the functional modules of design schema. It improves the work efficiency of vocational operators, reduces human resources cost, enhance data accuracy and safety at the same time, provides solutions and design ideas for the research and development of seismic data primary process software.

References