

## Study on the Construction of Lightning Protection and Safety Supervision System in Qingdao

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**Keywords:** Lightning protection business, Risk assessment, Security management system, App.

**Abstract.** Qingdao city has built lightning protection supervision system in 2013, and the system has basic information collection, daily safety management, lightning protection business data integration and the full information management functions of the ultimate decision-making analysis. The system not only has save time, reducing cost and improving administrative efficiency, but also has special significance for the accident disposal of lightning disaster. The subsequent carries out analysis and processing for the large amount of stored data in the system, and we will get some useful knowledge and can help the improvement of the municipal lightning protection business process. This paper mainly introduces the system realization technology and present application advantages.

### Introduction

After the statistics found, lightning protection business in recent years has outstanding achievement in Qingdao city, it needs for lightning detection unit up to more than 3300 in each year, acceptance unit up to 2500 and the completion of lightning protection number up to more than 500 [1]. As a department of the mine industry is mainly responsible for the current new project of mine safety administrative license, audit new renovation project lightning protection engineering design drawings, the completion of the project acceptance, lightning disaster risk assessment, lightning accident investigation, detection supervision units lightning protection and other social management functions. A lot of lightning protection and integrity risk propose the renewal and higher requirements for lightning protection and safety management [2-3]. In order to further do strengthen the supervision of lightning protection, people should increase the intensity of mine safety protection supervision work, strengthen mine safety production track inspection, reference Qingdao city management platform and hazardous chemicals monitoring platform and other successful experiences, at the same times people also refer to increasingly sophisticated information systems and advanced mobile Internet technology to build the mine safety supervision platform in Qingdao city, it can realize real-time supervision for the unit mine safety and bring into the city's key regulatory units, to effectively improve the real-time monitoring level of mine safety.

### System Design Scheme

**System Design Target.** The design goal of lightning protection supervision platform is to be able to become a real-time information query platform, the lightning protection information of city key units can quickly query in real time giving a visual interface of the GIS system, to meet the needs of management mine safety supervision; for the industry provided interactive platform, inspectors by handheld mobile terminal will real-time test unit information transmission platform, to meet the needs of information platform real time update; for the safety supervision platform, the system will automatically prompt unit testing time, annotation refuse inspection unit, unqualified, rectification unit, to meet the required for tracking supervision inspection [4,5]. According to the business management process of lightning protection center, it can achieve the core of the safety and supervision, to build real time, anywhere and integrated regulatory information system. Through strengthening the security monitoring and management, strengthen the management and control of

the field, system can realize the centralized safety control, so as to improve the lightning protection ability and response ability of the lightning protection center.

**System overall structure.** According to the business management process of lightning protection center, the security supervision platform is the core of the security supervision, to build the real-time, anywhere and integrated supervision information system, and to achieve mobile information reporting and personnel management as well as centralized security monitoring and dynamic tracking [6]. Through strengthening the security monitoring and management, we can strengthen the field management and control to realize the centralized safety control, so as to improve the safety ability and response ability of lightning protection center.

The system user is divided into business personnel of using mobile App secure information acquisition system and management personnel of using PC security management system [7-9]. According to each user's operating authority, users will enter the respective operating interface in each login por. The overall frame diagram of system is shown in Figure 1.

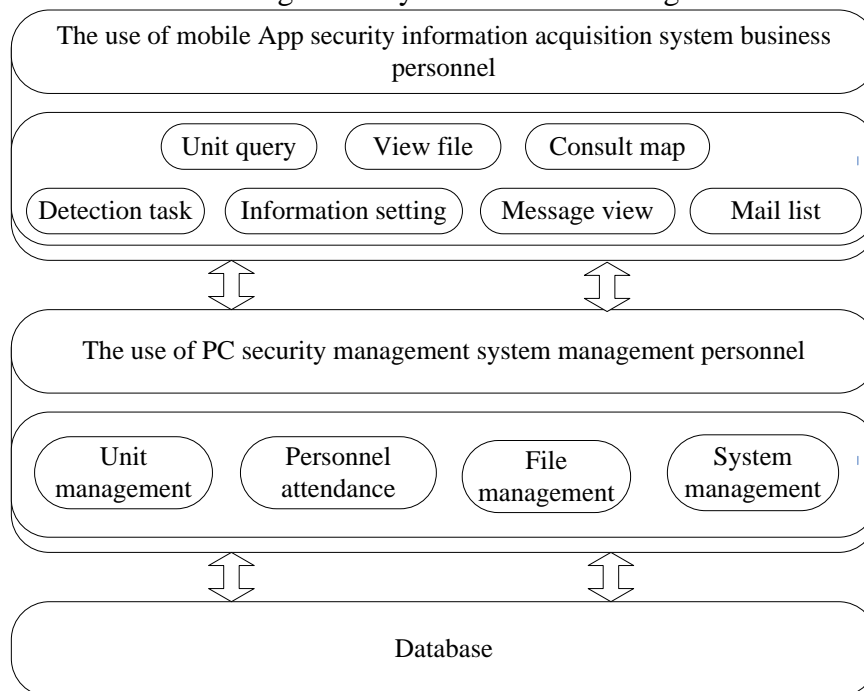


Fig. 1 The overall structure diagram of the system

**Build business model.** In the process of business model design, lightning protection and disaster reduction will delete the elements in work or secondary position, so that the corresponding business model of mine safety supervision platform in Qingdao city is much more simple, clear and easy to deal with than the real affairs [10]. The business model of mine safety supervision platform in Qingdao city mainly includes security check processing process, new units' excavation treatment process, daily inspection business process, inspection personnel management process and audit process.

In the lightning protection daily test business process as an example, when management promotions through logging in safety management system of Qingdao mine safety supervision platform based on PC, people can make the test plan according to the relevant requirements of lightning protection and disaster reduction department, after Qingdao mine safety supervision platform included plans, it will send information to the responsible unit area's inspection personnel; when the inspection personnel using a mobile phone logs in security information collection system of lightning supervision safety platform based on mobile phone App, it will be subject to inspection plan, it is one by one to test the indicators of supervision units for lightning protection and disaster reduction in accordance with the relevant requirements of the test plan within the specified time, and the use of mobile phone APP records each detected value, they respectively have inspection personnel and units responsible after completion test to carry on signature confirmation [11]. As the security management system managers based on PC, they can real time check the data uploaded by

the inspection personnel, the data will be imported in the old system to analyze, and then the old system generates reports to send management personnel and inspection personnel. The process chart of daily inspection business is shown in Figure 2.

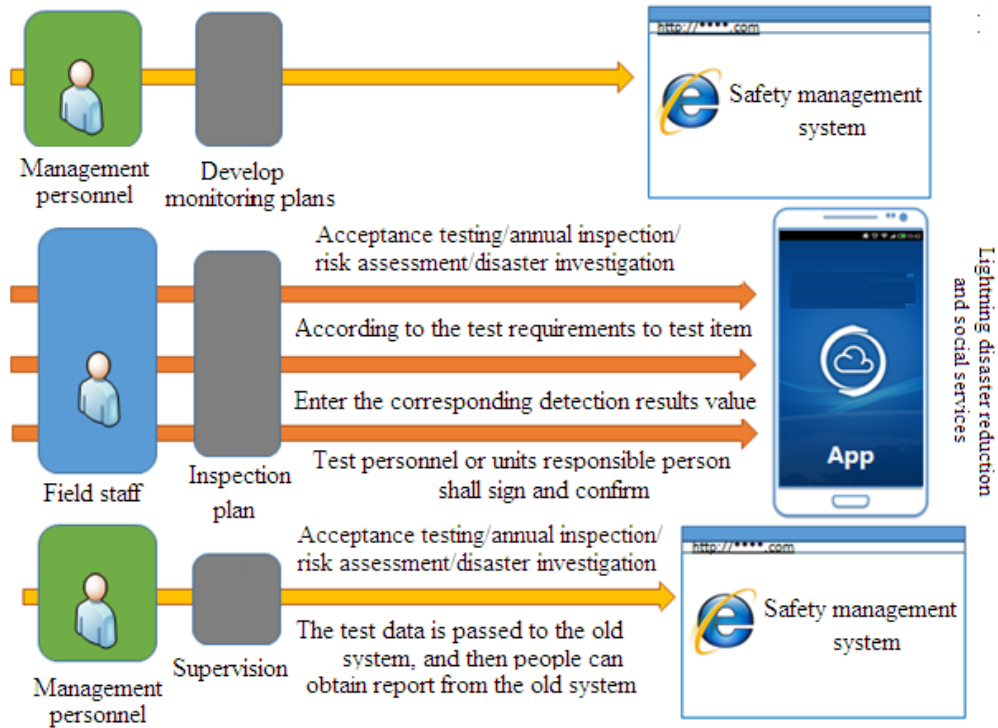


Fig. 2 The process chart of daily inspection business

### System Function and Knowledge Discovery

According to the demand analysis of the early stage, the system can be divided into five functional modules. The system overall function diagram is shown in Figure 3.

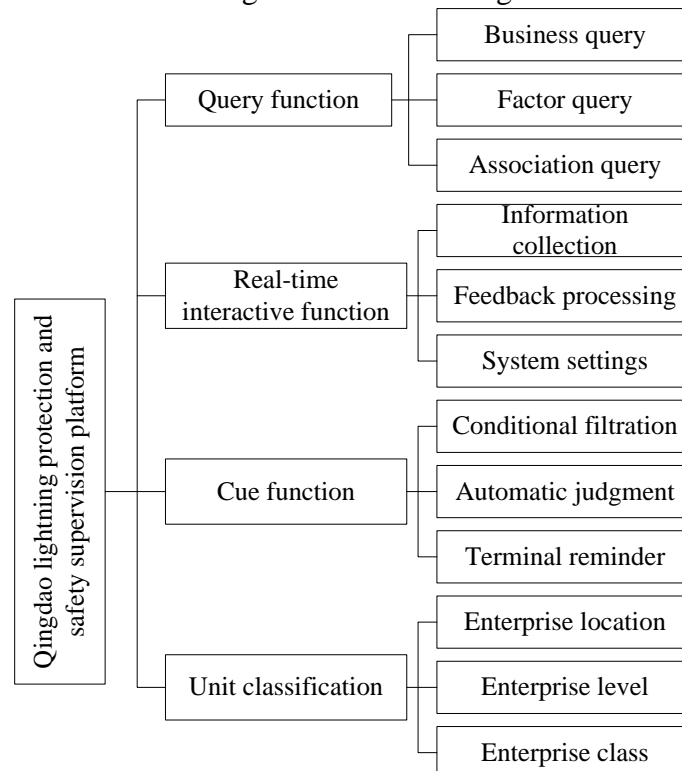


Fig. 3 The overall function diagram of lightning protection and safety supervision platform in Qingdao city

In this paper, a large number of data systems are analyzed by Apriori algorithm, and then some meaningful knowledge information is obtained. The most important mining frequent itemsets flow chart of using Apriori algorithm is shown in Figure 4.

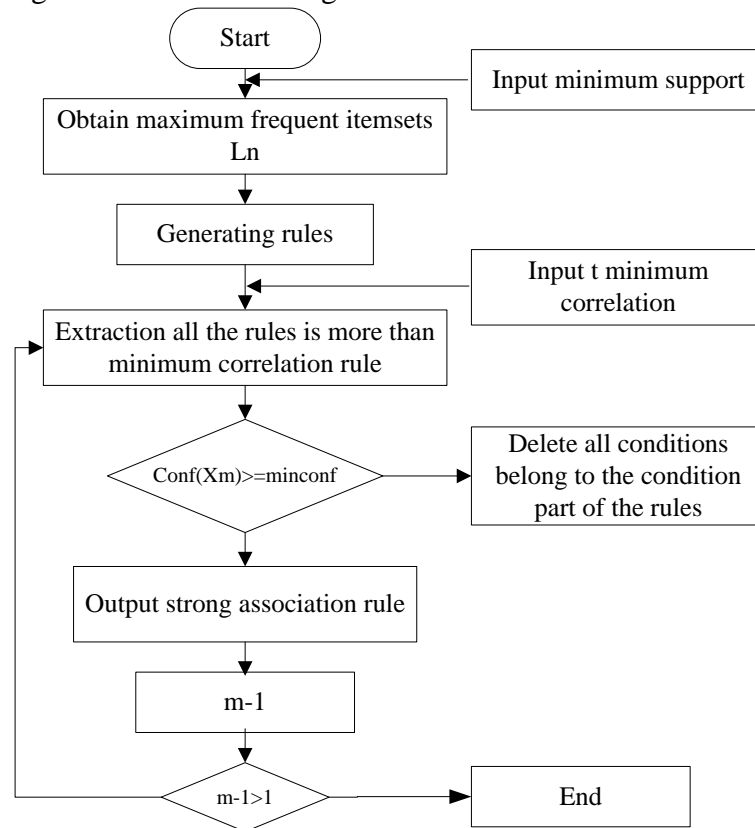


Fig.4 The flow chart of Apriori frequent itemsets algorithm

## Summary

In order to further improve the mine safety supervision work, increase the mine safety production supervision and strengthen mine safety production track inspection, we have the aid of increasingly sophisticated information systems and advanced mobile Internet technology to build mine safety supervision platform in Qingdao city, at the same times we can be the city's key regulatory units into a platform, to realize real-time supervision of the unit mine safety and effectively improve the mine safety real-time monitoring level.

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