Application of SQL in Data Management about TBM Breaking Test Machine

Zinan Wang *, Qingyuan Wang, He Wang, Jian Sun and Qi Wang

School of Mechanical Engineering, Shenyang Jianzhu University, Shenyang China

*Corresponding author e-mail: wzn591672678@126.com

Abstract. With the widespread use of database in all walks of life, database is used for management, storage and query more and more. SQL is a computer programming language used for database management and query, and it is one of the important foundations of database management system. In this paper, the data management system for TBM is researched with the combination use of Visual Studio 2008 software platform and SQL language. Firstly, it is analyzed that how to establish and develop a database system. Then how to update and query the database is analyzed. Finally, how to enhance the security of the database is explained. Therefore, data is provided for the force analysis of the TBM cutter when cutting rocks and the ability of data updating and processing is improved with the application of the database, which has far-reaching guiding significance.

1. Introduction

With the continuous innovation of computer technology, the application of computer plays an important role in the industrial production. The data information of the product is stored in a large number of computers. The application of the database is more and more important, the flexibility of the database has been greatly enhanced, which makes the contribution to the improvement of the production efficiency of the product. SQL is a comprehensive, structured and programming language for accessing data, querying, updating and managing database systems.

Database is the foundation of information resource management. It is a warehouse for organizing, storing and managing data according to data structure. Database in storage process is not mature enough for security, expansion and application. Foreign scholars Bertino, E. and Sandhu, R. had studied and analyzed database security [1]. Adrian Spalka and Jan Lehnhardt proposed the method of extending the system database and user interaction by using SQL Server2000 [2]. Vieira, M. and Madeira, H. Vieira, M used database management system (DBMS) to study data infrastructure components [3]. At present, our country has also done a lot of research on database system. Jiang Yan and so on used XML document storage method to achieve massive data storage and query [4]. Chen Ke and others had studied deeply in the field of database security [5]. Jiao Zijun used SQL language to maintain database and update operation [6]. Tan Xin and so on used SQL language to develop scraper conveyor product management system. [7] Shen Hongyu analyzed the main functions of Oracle and SQL Server database security and introduces the connection between various databases. Han Zhonghua and so on had studied the method of using SQL Server 2005 to accomplish the implementation of timing operation and coordination mechanism [9]. But the research on the safety,
inquiring and updating of the data of the shield rock crushing test machine is not enough. It is difficult to realize the function of the intelligent data management system of experimental data management system.

This paper uses SQL language and Visual Studio 2008 software to design data management system for a large number of cutter stress values produced by different rock types and different parameters in rock breaking experiment. The test machine database management system can improve the access, query, update and security and so on.

2. Design and implementation of database

2.1. The structure and characteristics of database
The data management system of the TBM breaking test machine is designed according to the requirement of the experimental data. The E-R diagram of the whole data relation is designed, the SQL statement is written, the database of the test machine management system is set up, and the simple and efficient function is realized through the Visual Studio 2008 platform programming. The application of SQL Server 2005 and Visual Studio 2008 is used to synchronize the link, and the real-time data and historical data are preserved for a long time. All the update and query of the experimental data information are carried out through the mode of view, which facilitates the operation of the users, and the application of view can be more intuitively embodied in its intelligence.

2.2. The establishment of database
The purpose of establishing the database of TBM test machine is to make it convenient for the users to read and operate the data information under the environment of a large number of data given by the test machine. Its establishment is based on theoretical relations, logical patterns and overall E-R diagrams, and then creates the structure of the database so that it has the function of storing, deleting and querying data to achieve the best pattern. In order to facilitate the query operation, the database management system of the test-bed adopts the form of multi form view to carry out the whole course operation. We only need to set up a test information database of the test machine, execute SQL statements in Visual Studio, and realize the data processing function of the system. The management system consists of 3 parts: system management, data management and data analysis. By clicking on the window menu, the user can get access to the main interface for real-time query, entry, and modification.

2.3. Data entry and deletion

2.3.1. Data entry. In the database test of TBM breaking machine, obtaining real-time database is an indispensable step and determines the quality of data. Therefore, data entry has also become the core part of database updating. The data management system of the TBM crushing test machine is a multi table experiment data entry under the conditions of different rock types, with the different penetration rate and the cutting speed related to the cutter. The database interface uses multi frame mode to record the data intuitively and conveniently. The main contents of the experimental data entry are as follows: three direction dynamometer value, X direction value of hydraulic dynamometer, Y direction value of hydraulic dynamometer, and Z direction value of hydraulic dynamometer.

The data management system increases the function of missing data entry, checks the input of the client in the program and prompts the blank input in the program, effectively avoids the loss of data in the original system or the occurrence of the incorrect data, so that the experimental data can be easily and efficiently.

The statements that indicate the missing data function are as follows

```csharp
if (comboBox1.Text.Trim() == "")
    MessageBox.Show("Rock types can't be empty!"); return;
if (comboBox2.Text.Trim() == "")
    MessageBox.Show("Rock types can't be empty!"); return;
```
2.3.2. Data deletion. Data deletion occupies a large proportion in the integrity, accuracy and timeliness of updating database information. The failure of experimental data restricts the data quality of hob to a large extent, and affects the analysis result of cutter. The rock breaking test machine of TBM will encounter many uncertain factors in the process of experiment, and may produce a lot of miscellaneous and inaccurate data. Therefore, a large number of failure data must be deleted to ensure its accuracy and simplicity when conditions change. Data deletion is complex and heavy workload on the original system. The deletion of the redundant data may result in the change of the data sequence or the consistency of the data. The accuracy of the cutter stress value can only be ensured by manually adjusting or redefining the parameters of the system, and the efficiency of the work is reduced. However, using the test machine data management system, the deleting function can be realized flexibly through the SQL statement, which can improve the execution ability, ensure the authenticity of the data, and play an important role in the research and analysis of the TBM machine cutter.

Delete functional statements are as follows:

```csharp
{db.con.Open();
    String sql2 = "delete from t_huizong where style = " + comboBox7.Text.Trim() + "" and guanru = " + comboBox8.Text.Trim() + "" and sudu = " + comboBox9.Text.Trim() + "";
    SqlCommand cmd2 = new SqlCommand("", db.con);
    SqlDataAdapter adap = new SqlDataAdapter(queryString, db.con);
    DataSet ds = new DataSet();
    adap.Fill(ds);
    dataGridView1.DataSource = ds.Tables[0];
    db.con.Close();
}
```

2.4. Data query

The storage of each data is handled through batch processing by SQL statement. Data query is to extract corresponding data by storing the given field name. Data query is to get accurate information in a relatively short time. Because of the large amount of data produced in the experiment of the TBM breaking, it is necessary to take the important parameters and relevant information of the data. Using SQL Server can make the system have good query ability, reduce workload greatly and improve the efficiency of query.

In the database of rock crushing test machine, in the process of breaking different kinds of rock, the large amount of stress data of each rock corresponding to the different parameters has been stored in the database in a unified and orderly manner. The corresponding speed and penetration can be inquired. In order to satisfy customers' demand for obtaining different kinds of rock data and the maximum stress value of cutter during cutter rock breaking process. The management system applies the Visual Studio 2008 software to design the query interface under the premise of selecting the maximum data in SQL language. The query interface uses Gridview control to display the data. The data display part is made up of two modules: all the data and max data of the rock. The database query can be carried out clearly and intuitively, increasing the selection function of rock types and its parameters, simplifying the user's cumbersome management, convenient users and improving the efficiency of inquiry.

3. Database security

The security of database is an important research field. The leakage or destruction of database data will bring huge losses to the enterprise. In general, server security management, database security management and database object access authority management, the three layer structure management, constitute the security model of SQL Server. The login account in access authority management is
divided into two modes: Windows authentication model and mixed mode. The landing account of the database management the TBM rock breaking test machine system adopts the mixed mode, uses the login account to authenticated the connection server, restricts the access database through the user name and password of the database, and forms the security system of the test machine database. After Visual Studio connection test machine database, using SQL Server identity authentication database landing, authenticate, the successful connection of SQL Server is to achieve system synchronization. The management system simplifies the tedious operation of SQL Server login authentication. Visual Studio has access to the object of the test machine database, the authority of execution action, the verification of the permission, and the authentication of the SQL Server security system. Visual Studio has access to the object of the test machine database, the authority of execution action, the verification of the permission of the statement permission, and the authentication of the SQL Server security system. By using the interface security password mode, it can make the operator convenient and quick landing inquiry, can provide security information, effectively prevent others from stealing or leaking related information, and improve the security of the system.

Because the shield rock breaking test machine needs many people to cooperate with each other in the experiment, different experiments are faced with different permissions. In order to better solve the problem of operator's rights allocation and effective user management, the test machine management system increases the function of adding, deleting, and level allocation of username, which meets the needs of different users and improves the intelligence and flexibility of the user management system.

User name add functional system language:

```csharp
{db.con.Open();
    string sql = "select count(*) from Users where uid=" + textBox1.Text.Trim() + ";"
    SqlCommand cmd = new SqlCommand(sql, db.con);
    if ((int)cmd.ExecuteScalar() > 0)
    {
        MessageBoxIcon.Show("repeat of user name!");
        db.con.Close();
    } else
    {
        if (textBox2.Text.Trim() == textBox3.Text.Trim())
        {
            sql = "insert into Users values (" + textBox1.Text.Trim() + "," + comboBox1.SelectedValue.ToString().Trim() + ");"
            SqlCommand cms = new SqlCommand(sql, db.con);
            cms.CommandText = sql;
            cms.ExecuteNonQuery();
            MessageBoxIcon.Show("User added success", "Operation hints");
            db.con.Close();
        } else
        {
            MessageBoxIcon.Show("Your two password is not consistent ,please resume load it", "Operation hints");
            db.con.Close();
        }
    }
}
```

4. Conclusion

The research and development of the database management system about the TBM rock breaking test machine has increased the processing capacity of the data, simplified the complicated data query and update mode, and provided convenient conditions for the user to query, which the stress of the cutter and its numerical analysis during the rock breaking process of the test machine. In the aspects of data query, update and security, the convenience and accuracy are embodied intuitively, so that the rock breaking experiment data of the cutter are of great significance in the application.
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