

Design of handheld terminal of equipment management system based on Windows CE

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Abstract. Equipment Management level decides the production efficiency and the cost of production. Traditional equipment management has many problems, such as lower efficiency, decentralized information and so on. According to the demand of coal enterprise and the modern development requirements of coal mine electromechanical device management and repair system, the application system of equipment management, especially the handheld terminal, was developed based Windows CE. Human-computer interaction interface for each function module was developed. The handheld terminal can realize wireless connection and synchronization technology for instrument and equipment management system. It can realize equipment spot-inspection work effectively, improve the reliability of equipment and reduce the incidence of failure.

I. Introduction

The level of equipment management and maintenance decides an enterprise's production efficiency and production safety. Coalmine equipments have some characteristics, such as complex production environment, equipment multiplicity, wide distribution, enormous information, expensive price, and so on. So it is necessary for coalmine enterprises to improve equipments reliability, decrease incidence rates and reduce maintenance cost. The equipment management system based on cloud calculating can meet the need of coalmine enterprises.

II. Structure of equipment management system

The structure of equipment management system is shown in Fig.1. Wireless sensor network nodes are installed on equipments. Handhold terminals collect data of all kinds of equipments and then upload data to enterprise server by wireless modules. The Massive Data are sent into Cloud server. Between handheld terminal and enterprise server, data can be exchanged through USB or WIFI. Computer name must be input into the Dialog box of interface server when using USB and server IP address and port number should be input when using WIFI. The communication of handheld terminal and server is finished simultaneously by RDA (Remote Data Access). It can perform data synchronous communication with the server by wireless network, which includes data up-download and update.

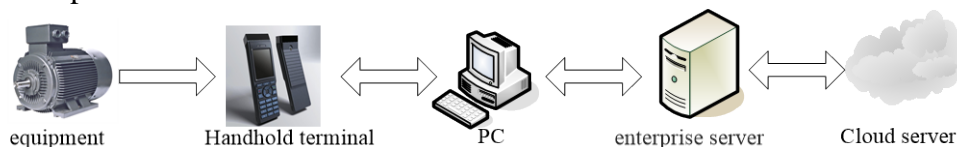


Fig.1 structure of the system

III. Design of handheld terminal system

Handhold terminal system was developed on the platform of Windows CE 6.0 operating systems. Embedded database SQLCE 3.5 was used as its internal database and PowerDesigner15 was used to realize database modeling and build data sheets.

Function modules of handheld terminal consists of six modules, i.e. login module, RFID Regional card module, spot checking module, communication module and auxiliary functions

module. Login module is divided into account password module and RFID recognition module. After successful authentication, the technician can download spot checking task data and fault data. RFID Regional card module reads RFID card numbers and matches with spot checking data. After successful matching, the system begins to collect data. Spot checking module query fault sheets for those abnormal data and began maintenance work according standard operation. Communication module download operation standard data and upload collected spot checking data. Auxiliary functions module can collect vibration and temperature data.

Removable embedded database SQL CE is used in the handheld terminal, which is mainly used in the removable equipments to manage data. It has powerful Search and query capabilities. The system's removable database consists of four parts: basic information data sheet, spot checking task data sheet, fault data sheet and maintenance standard date sheet.

Basic information data sheet is used to record staff information, equipment categories information and equipment account information. All the relationships between sheets is shown in Fig.2.

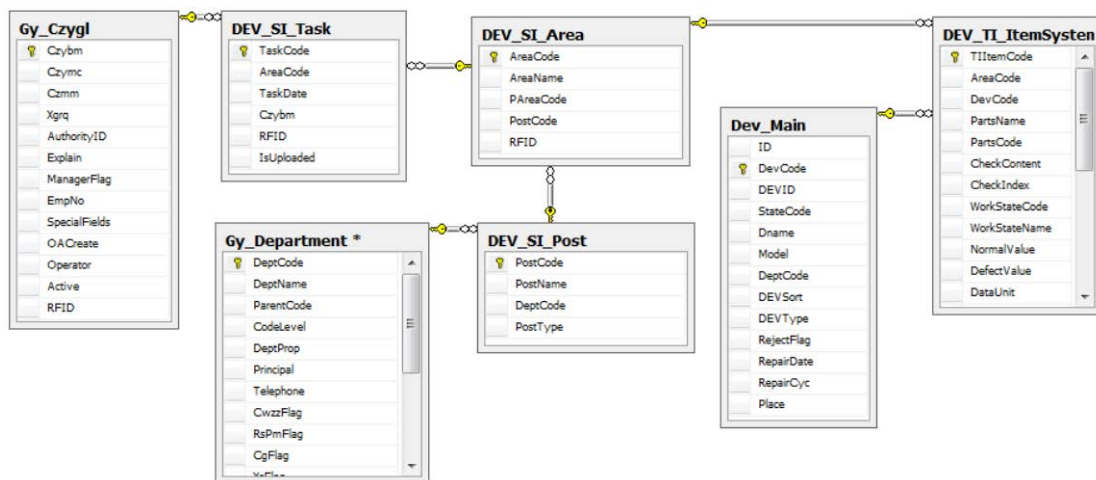


Fig.2 relationships between basic information sheets

Spot checking task data sheet is used to manage spot checking task. According to the inspection task process, it builds inspection postcode sheet, inspection area sheet, inspection operation standard sheet, checked items sheet and so on.

Fault data sheet includes fault cause sheet and fault system sheet. It is used to manage the information of fault cause and fault time. Fault cause sheet is connected with inspection operation standard sheet according fault code. The relationships between the sheets is shown in Fig.3

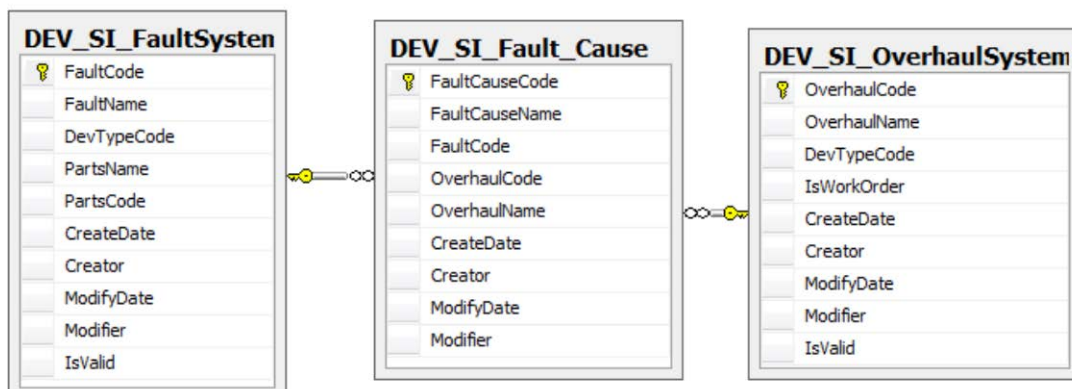


Fig.3 relationships between fault data sheets

Maintenance standard date sheet is used to manage maintenance process aiming to fault cause. It includes personnel, material, equipment, process, safety measures of maintenance, and so on.

The inspection system synchronizes data with RDA (Remote Data Access) mode. It's realized as follows:

```
SqlCeRemoteDataAccess rda = new SqlCeRemoteDataAccess();
rda.LocalConnectionString = Settings.AppSettings.ConnectionString;
```

```

private string InternetUrl{
get { return @"http://" + _serverIpName + @"/" + _virtualPath
+ @"/sqlcesa35.dll"; } }
private string OleDbConnectionString {
get { return @"Provider=SQLOLEDB;Data Source=" + _serverIpName +
@";Initial Catalog=" + _databaseName + @";UID=" + _userName +
@";PWD=" + _password + @";"; } }
public int TestServer( ) {
int nRet = 0;
SqlCeRemoteDataAccess rda = new SqlCeRemoteDataAccess();
rda.InternetUrl = this.InternetUrl;
rda.LocalConnectionString = Settings.AppSettings.ConnectionString;
rda.InternetLogin = "";
rda.InternetPassword = "";
try {
rda.SubmitSql("SELECT 0", this.OleDbConnectionString); }
catch (SqlCeException ex) {
switch (ex.NativeError)
{
case 28627: nRet = 1; break;
case 28037: nRet = 2; break;
default: nRet = ex.NativeError; break;
} }
Finally {
rda.Dispose(); }
return nRet; }

```

IV. Conclusion

In this paper, the handhold terminal system was introduced, which was developed on the platform of Windows CE 6.0. Embedded database SQLCE 3.5 was used as its internal database and PowerDesigner15 was used to realize database modeling and build data sheets. Function modules of handhold terminal consists of six modules, i.e. login module, RFID Regional card module, spot checking module, communication module and auxiliary functions module. Login module is divided into account password module and RFID recognition module. Handhold terminal and enterprise server can exchange data through WIFI or USB. This system has been applied in coal enterprises. It operates steadily and is able to effectively implement the measurement and management of equipment spot checking, improving the reliability of equipment and reducing the failure rate of equipment.

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