Design and Implementation of Urban Rail Train Management System in Huaian City

Yuanyuan Wang[a], Suyun Ding[b]

College of Computer and Software Engineering, Huaiyin Institute of Technology, Huaian, 223003, China
E-mail: [a] zhfwyy@hyit.edu.cn; [b] 1261205817@qq.com

Abstract—**At present, about the operation of the Rail Transit Train control technology at home and abroad are constantly improve, in order to improve the Operation Efficiency of Train and reduce the Operation Cost of the Train, so as to enlarge the using range of Urban Rail Trains, Trains were collected through field investigation, data and personnel information, USES the Apriori Algorithm, Database Technology, such as MD5 Encryption, Graphics, statistics says Huaian City Rail Train Management System was implemented. This system adopts the Three-Tier Architecture and the Visual Studio 2015 and SQL Server2008 development tools, and integrates the JavaScript, HTML5, CSS3, jQuery and other technologies to form the overall plan of the development system.**

Index Terms—**urban rail train, three-tier architecture, Apriori algorithm**

I. INTRODUCTION

Social economy is developing in our country, the urban traffic is expanding constantly, the rise in the number of vehicles, the subway, light rail, high-speed rail, trams and other transportation is gradually appeared in the public view, urban rail transit has become the indispensable part of the transportation [1]. Nowadays, the regional economic and urban agglomeration in the constantly expanding, connected region highway passenger transportation is not the only ones, and inter-city railway and the railway passenger transportation, so the connection between the area and the area of special railway line also known as the rail transit. Since the founding of new China, rail transit has gradually developed in our country, from the original a few cities have to now, most of the cities from the original single convenient railway line to the present complicated railway line, rail transportation in China has achieved a leap in [2, 3]. At present, most cities in China has been dedicated to the construction of urban rail transit, the next few years there will be more cities will orbit transportation construction in the urban development, urban rail transit will soon celebrate its golden age [4].

In many transportation ways, rail transit is one of the best prospects for development, its relationship with social and economic development, is an important basic industry, and critical national infrastructure is the backbone of the comprehensive transportation system and one of the main mode of transport [5]. Huaian city rail train management system is to speed up the development

of huaian city rail train, improve the utilization rate and safety of urban rail train, to discover the problems existing in the train in order to solve in time, greatly promote the development on the traffic.

II. SYSTEM FUNCTION MODULE

After preliminary investigations of huaian city rail train, based on the characteristics of urban traffic, huaian city rail train management system is mainly designed the user login, user information, equipment information, fault management, fault statistics, statistical and password modification module, such as developers, according to the function of each module needs a complete design of urban rail train management system. The main functional modules of huaian urban rail train management system is divided as follows:

A. User Login Function Module

The participation role of huaian urban rail train management system is mainly divided into super administrator, station administrator, vehicle driver and repairman. The system has the maximum operating authority is the super administrator, under the management of the super administrator can carry out the corresponding operation of the system.

B. User Management Module

Only super administrators have operation permissions the user management module, the super administrator can view and the specific operation in the module, the super administrator can add user in the module, according to the user's specific information to fill in, and login name, contact phone number, E-mail and other relevant information belongs to the required information, any wrong filling filling an information will lead to add user operation failed. Add successful user information to display in the interface in time, if the user information changes, the super administrator can edit changes.

C. Train Equipment Module

In the main interface of this function module, vehicle number, name, vehicle start time, end time and running status can be displayed. System operators are available on the four roles function module to add the vehicle operation, the operator to fill in according to the specific situation, each train has equipment list, repair service, driving record and edit the four operations, the device can display the train in the list of equipment information and you can set the life cycle of the equipment, the operator can according to the usage of the train to the repair of railway equipment, fault repair service function USES

the Apriori algorithm, due to the diversity of urban rail train failure data, the system after receiving operator service data in a timely manner to fault data entry to the database, The fault data is preprocessed in the database and then sent to the fault management module from the database. Each role operator can view and edit the information of the train in this module.

D. Fault Management Module

In this function module shows the vehicle number, vehicle, the repair personnel, warranty time, status, maintenance personnel, and the details of the maintenance time, the function modules of operator role only the super administrator and maintenance personnel, the two systems to failure data extracted from fault form in the database, and inform the maintenance personnel fault number, so that maintenance personnel can check in time, the super administrator and maintenance personnel can click the view button to have a problem of equipment maintenance. According to the maintenance status, there are three possibilities for the maintenance status of the interface. The second is to click to view but not repair, showing maintenance; The third is not checked, showing no maintenance.

E. Failure Statistics Module

The function module is on fault information statistics, use the bar graph and circular statistical figure two statistical methods statistical analysis was carried out on the relevant information, statistical figure the annual quarterly monthly failure data, the operator can according to their own requirements to view the statistical figure.

F. Traffic Statistics Module

In this function module, the statistics chart of folding lines is used. The system can make statistics according to the driving time of the driver, and the system will update the statistics chart according to the different months.

G. Modify Password Module

In this function module, the operator can be modified according to their own requirements for the password, the password in the database for the MD5 encryption, even in the database to check the password, see also processed gibberish, anyone can't see the specific code, MD5 encryption method to ensure the confidentiality of the password, to strengthen the safety index of the system.

III. DETAILED SYSTEM DESIGN

A. System Architecture Design

Huaian urban rail train management system USES a three-tier architecture, which is divided into three parts: data access layer (DAL), business logic layer (BLL) and presentation layer (UI)[6]. The collection and display of user data is carried out in the presentation layer. Business logic layer between the presentation layer and data access layer, the BLL layer after get the UI layer from the user instructions timely perform the corresponding business logic, when need to access the data source, directly to the data access layer (DAL) for processing, processing is completed, return the necessary data to the presentation layer (UI). The data access layer (DAL) works with the database to provide basic data access. In this system, users in the presentation layer for interface design,

concrete in the BLL layer to perform operations of each function module, database access, to pick up the data in the database of feedback to the business logic layer and presentation layer [7].

B. System Foreground Design

The main operating roles of huaian urban rail train management system is super administrator, station administrator, vehicle driver and maintenance personnel. Super administrator after login system can add users in the user management for operation, the operator due to some external factors need to modify the personal information, the super administrator can modify personal information to operators. Super administrator and maintenance personnel can also see the fault information, maintenance personnel to repair the fault, maintenance is completed according to vehicle number or vehicle name query to have the vehicle maintenance. The driver of the vehicle can compare the time when he drives the vehicle with the time when he should start the vehicle, so as to check whether the time when the vehicle starts is on time. Train driving equipment, fault statistics, statistics and password maintenance are every role permission, each system operator can view and operate the specific content of several function modules.
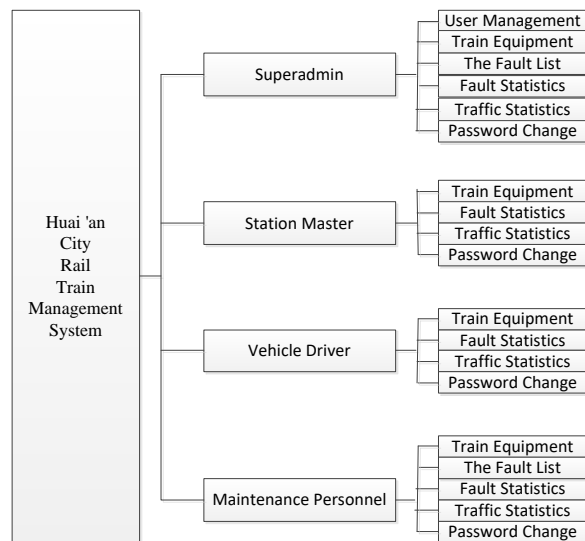

ure 1. System function module chart

C. System Background Design

System established in DAL layer through a class called 'cityraildal' database, extract data from the database to the fore, set up the BLL layer on front desk data read operations and processing background database data. Each functional module of the system adopts the idea of three-layer architecture. The system addition interface USES the MD5 encryption method and constrains and verifies the data. The main implementation code is as follows:

1) The Main Code of the UI Layer

```
protected void btn_Click(object sender, EventArgs e)
    {
        if (this.Fullname.Value == "") {
        this.Page.RegisterStartupScript("            ",
    "<script>alert(' The name cannot be empty ');
```

```
</script> ");
    return;
}
if (this.IDNumber.Value == ""){
this.Page.RegisterStartupScript(" ", "<script>alert('
The identity number cannot be empty '); </script>
");
return;
}
if (this.Email.Value == ""){
this.Page.RegisterStartupScript(" ", "<script>alert('
Login mailbox cannot be empty '); </script> ");
return;
}
if (this.Telephone.Value == ""){
this.Page.RegisterStartupScript(" ", "<script>alert('
Contact Numbers should not be blank '); </script>
");
return;
}
if (this.PASS.Value == ""){
    this.Page.RegisterStartupScript("            ",
    "<script>alert(' Please   enter   your   login
    password '); </script> ");
return;
}
user.Fullname = this.Fullname.Value;
user.Email = user.NAME = this.Email.Value;
user.IDNumber = this.IDNumber.Value;
user.Address = this.Address.Value;
user.Age = this.Age.Value;
user.Sex = this.MAN.Checked ? " Male " : "Female
";
user.Telephone = this.Telephone.Value;
user.TYPE = int.Parse(this.ddTYPE.SelectedValue);
if (user.Telephone.Length != 11)
{
this.Page.RegisterStartupScript(" ", "<script>alert('
Please enter a valid phone message '); </script> ");
return;
}
if (Request["id"] != null)
{
    user.Id = id;
    if (this.PASS.Value == "******")
        {
            user.PASS = pwd;
        }
    else
        {
            user.PASS                        =
            System.Web.Security.FormsAuthenticatio
            n.HashPasswordForStoringInConfigFile(t
            his.PASS.Value, "MD5");
        }
    if (_bll.UserModify(user))
        {
            this.Page.RegisterStartupScript("   ",
            "<script>alert('   Save   success   ');
            window.location.href='UserList.aspx';</sc
```

```
ript> ");
        }
    }
    else
        {
            user.PASS                        =
            System.Web.Security.FormsAuthenticatio
            n.HashPasswordForStoringInConfigFile(t
            his.PASS.Value, "MD5");
        if (_bll.UserAdd(user))
            {
                this.Page.RegisterStartupScript("   ",
                "<script>alert('   Save   success   ');
                window.location.href='UserList.aspx';</sc
                ript> ");
            }
        }
}
```

2)The Main Ccode of BLL Layer

```
public bool UserAdd(UserEntity user)
    {
        return _dal.UserAdd(user);
    }
```

3) The Main Code of DAL Layer

```
public bool UserAdd(UserEntity user)
    {
        string    sql    =    "insert    into    TblUser
    values(@NAME,@PASS,@TYPE,@Fullname,@Te
    lephone,@IDNumber,@Email,@Sex,@Age,@Addr
    ess)";
        SqlParameter[] sps = new SqlParameter[]
    {
        new
    SqlParameter("@Name",SqlDbType.VarChar){Valu
    e=user.NAME},
        new
    SqlParameter("@PASS",SqlDbType.VarChar){Valu
    e=user.PASS},
    new
    SqlParameter("@TYPE",SqlDbType.VarChar){Valu
    e=user.TYPE},
        new
    SqlParameter("@Fullname",SqlDbType.VarChar){V
    alue=user.Fullname},
        new
    SqlParameter("@Telephone",SqlDbType.VarChar){
    Value=user.Telephone},
        new
    SqlParameter("@IDNumber",SqlDbType.VarChar){
    Value=user.IDNumber},
        new
    SqlParameter("@Email",SqlDbType.VarChar){Valu
    e=user.Email},
        new
    SqlParameter("@Sex",SqlDbType.VarChar){Value=
    user.Sex},
        new
    SqlParameter("@Age",SqlDbType.VarChar){Value
    =user.Age},
        new
```

```
    SqlParameter("@Address",SqlDbType.VarCha
    r){Value=user.Address},
};

    this.ExecuteNonQuery(sql, sps);
    return true;
}
```

IV. CONCLUSION

This paper expounds the functions of huaian city rail train management system module, by means of analysis and design of urban rail train relevant information management, make on the management of urban rail train more strictly, institutionalization, standardization, the smooth development of working for the construction of urban rail train laid a solid foundation, improve the working efficiency.

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Yuanyuan Wang was born on Oct. 25, 1981. She is currently pursuing the Ph.D degree in Computer Science and Technology from Hohai University of China. She received the M.S. degree in Computer Technology from Nanjing University of Science and Technology, in 2010. She is currently a lecturer with the College of Computer and Software Engineering of Huaiyin Institute of Technology. Her current research focuses on computer vision.

Suyun Ding is a student of Huaiyin Institute of Technology.