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Research on enterprise small computer system construction applications in common use

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ABSTRACT

With the rapid development of computer science and technology as well as network communication technology, the computer technology information needs of different industries and different departments are growing increasingly. The manual management mode has been behind the development of the times, and the performance in university's computer lab is particularly prominent. In this study, by finding the shortcomings of computer lab management works, we start from the information needs of each laboratory management, combine with business management processes, act based on the analysis of the information needs of the computer lab and based on the .NET-based architecture, design small computer system that meets the business daily management in common use. This study mainly designs and builds a computer lab management archive-based platform. In the process of creating platform and platform debugging, some problems are also found, and there are some aspects that need to be improved, such as data backup problems in platform. The user's permission settings need further reflection, and the entity in module also needs to be added. There are some issues still lacking consideration. Although the platform has not yet been perfect, but its integration and openness make it promising in the future. The computer lab management can be broadened to the integration with other specialized laboratories, so as to establish data file that can be shared, and conduct unified management for multi-professional laboratories.

KEYWORDS

Small computer system; System construction; System development; .NET technology.



INTRODUCTION

Since the expansion of college enrollment, college students are constantly growing in number, and a lot of capital equipment is also invested in construction, especially after the 21st century, computers and networks continue to prevail and constantly improved computer technology. In addition, the computer hardware prices continue to decline, so the computer has gained popularity and become an indispensable tool in life. In universities, laboratory is a place to conduct experiments, and it can be deduced as the scientific research base, the generation place of technological development, and thus there is generally large investment in laboratory. In recent years, computer labs have particularly received rapid development. In order to meet the requirements of study and work, various computer labs come into being, and the classification also has increasingly clear trend, so the management of the computer lab has requirements at deeper level, which not only require good management of equipment in various laboratories, but also require optimizing computer resources, based on which a variety of file shall have classification and analysis, so as to provide basis for the managers to formulate long-term development guidelines. But now, the majority of university computer lab management methods relatively fall behind, most of which are based on labor management, which has brought heavy work pressure to the laboratory management personnel, therefore, to develop a computer lab management archive-based platform becomes very necessary, and the platform shall not only have standardized and scientific management of the laboratory, free managers from the heavy labor, but also provide data reference for decision-makers in a certain sense.

In recent years, there has been some computer labs in China that has developed similar system, such as the integrated management system designed by Tsinghua University, which is capable of realizing fully automated room management; Central South University of Technology has developed lab information management system allowing rational use of devices and network resources, which is implemented based on Web and mainly completes the automatic management of computer lab. At present, there are universities that complete the design of computer lab management system, and the preliminary open laboratory management concepts have already generated as well. In addition, there are some commercial software that have been developed for use, but the software is targeted to companies and not suitable for college computer lab. It can only provide a reference. Foreign laboratory management system started earlier, and has more rapid development. Now, it has promoted and used three phases, and the current phase has more emphasis on the overall management of laboratory.

According to the current information needs of the majority of colleges and universities, and by learning from the advanced experience and technology, the .NET-based computer lab management archive-based platform involved in this study is capable of conducting scientific and effective laboratory management. On the basis of reducing the work pressure on managers, it can effectively support the laboratory management working process, and provide an effective guarantee for the normal operation of equipment and laboratory.

DEMAND ANALYSIS

Overall demand

At present, most universities increase their investment in laboratory infrastructure and hardware devices, and the computer technology and network technology achieves rapid development, so software development cannot keep up with trends in hardware development. To address this issue, there are some universities conducting management software development for the existing computer lab according to the needs and they have also achieved some success, but there are still a large number of institutions that have significant problems in this regard. In terms of laboratory management, it is still in the stage of manual operation, and such management approach has brought heavy works to managers, resulted in low work efficiency, and it is prone to make mistakes in a lot of archiving and query works. Because management works are mainly manually conducted, it is impossible to clearly show the file as data and present it to the decision-makers, and it is impossible to provide a scientific basis for the development decision-making of laboratory. In this context, it is very meaningful to design a computer lab workflow as shown in Figure 1, which shall be shown as convenient and easy to operate interface and a computer lab management archive-based platform that can produce statements.

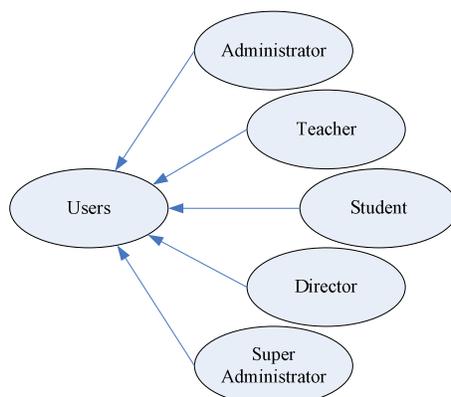


Figure 1 : The user right diagram

Starting from the computer lab management, the platform has the most important purpose to achieve standardized management of experimental archives. This management includes the data recording and establishment of management documents, in which the former mainly refers to the real-time tracking and recording of data generated from all aspects of computer management, and the latter's management document refers to generating the standardized management documents.

Information demand analysis

The purpose of this platform is to make lab management based on archives, which means integrating the above-mentioned standardized management documents, and that the platform must not only meet the management needs, but also record the data generated in management, and it shall automatically generate standardized management documents.

In the design of the platform, we should take full account of the different needs of different users for this platform. From the perspective of laboratory equipment administrator, these users need to track the initial information and use status of equipment, and to have real-time monitoring of computer hardware in lab for damage and whether the software needs to be updated; From the perspective of teaching managers, these users need teachers to provide an experiment plan students' computer use performance and students' attendance rate; from the perspective of teachers and students, these users need experiment plan, experimental analysis report and the final result output. After the completion of these information needs of different users, we will have a clear impression on the platform to be designed, so as to integrate the above information needs to, include those needs into the daily management of lab in the form of archive, and thus establish a computer lab management archive-based platform. The overall data flow of system is shown as Figure 2.

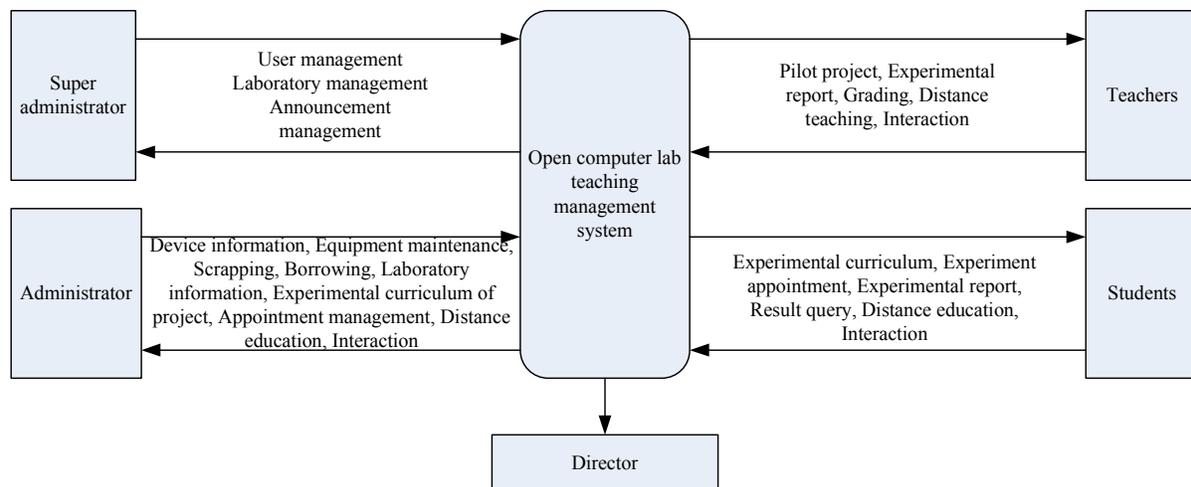


Figure 2 : Overall data flow of system

Functional demand

From the above analysis of information needs, we can learn that the platform shall be featured by the combination of the management of equipment, teaching and platform itself. In device management, there shall not only be the device hardware information, but also include maintenance and scrapping information of equipment; in teaching management, it is necessary to clarify the information of all laboratories and the experiment projects corresponding to each laboratory. The teacher and student users can log on to query experiment plan. There shall also be result accepting and submission of experimental analysis report; in terms of platform management, different users shall be provided with different permissions, so as to ensure the security and stability of platform.

In addition, a platform designed shall not only to meet management functions, but also meet the requirements of the following items, so as to ensure the stable operation of system: First, the design of platform shall to make the administrator be liberated from the manual management mode. Based on improving the work efficiency, it shall make work processes more standardized, so the platform must be stable and reliable; Secondly, the platform is to run in the university, so it shall also have openness and for lay a good foundation for adding other professional laboratory management in the future; thirdly, the platform has many users, so user-friendly design shall be added in the design, and the designed platform shall be as simple, easy to operate and user-friendly as possible; Finally, this platform database contains a large number of archive information, and it allows network connection, so security and confidentiality measures are vital. In data storage, the access to and modification of data information shall be the responsibility of specially authorized staff.

PLATFORM DESIGN

Based on the above information needs analysis, the computer lab management archive-based platform in this study consists of two parts: the business process from the perspective of teaching manager as well as its support process. The former is from the perspective of experimental teaching management, creating file information including experiment plan, results, attendance, and analysis report, and these salesmen shall be process-oriented; the latter is the management of

electronic files based on the above process, and these electronic files include the laboratory hardware device information, various types of user information as well as the equipment maintenance information.

Module design

According to the two parts of contents included in this platform, a total of six modules are designed, including experiment plan, attendance, analysis report, equipment, maintenance, and system management. Its modular functional structure is shown in Figure 3. The first module is designed as attendance management, including registration, statistics and query functions, so as to make it easy for experiment administrator to collect in batch. The information of attendance object can be completely set in the system module. The second module is designed as experimental teaching module, including submission of experiment plan, statistics and inquiry. The teacher users complete the submission of experiment plan, and the platform administrator makes relationship based on the experiment plan submitted and the laboratory and experiment time. If there is no conflict, then the experiment plan remains unchanged. If there is conflict, then the experiment plan shall be re-modified by the teacher user. The third module is the experiment report module, which includes submission of student experiment report, teacher’s reading of experiment report and final inquiry on results of the experiment report. In this part, the platform administrator of the platform can provide different users with different permissions so as to complete the operation of experiment report module. These three modules mainly complete the first part contents of the computer lab management archive-based platform, which means experimental teaching management business processes files constructed from the perspective of teaching manager.

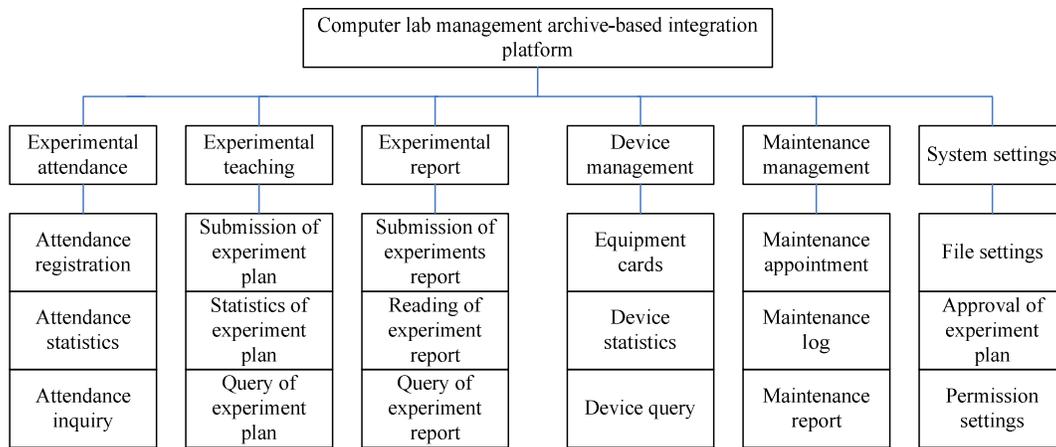


Figure 3 : Structure and function diagram of each platform module

Finally, in the first five modules, the last module, i.e. system settings module, can reflect its role, which module includes file settings, experiment plan approval and permission settings. This part of module is the platform that administrator uses most. From the file settings, the electronic files including information of laboratory equipment, administrator, teacher and student can be set; the plan approval can realize the experiment plan association in the second module; and permission settings can make it easy for platform administrator to conduct classification on various users and assign privileges to them.

Database design

Upon the analysis on teaching management and its support processes, we can determine the conceptual model of the computer lab management archive-based platform, i.e. the database E-R diagram as shown in Figure 4.

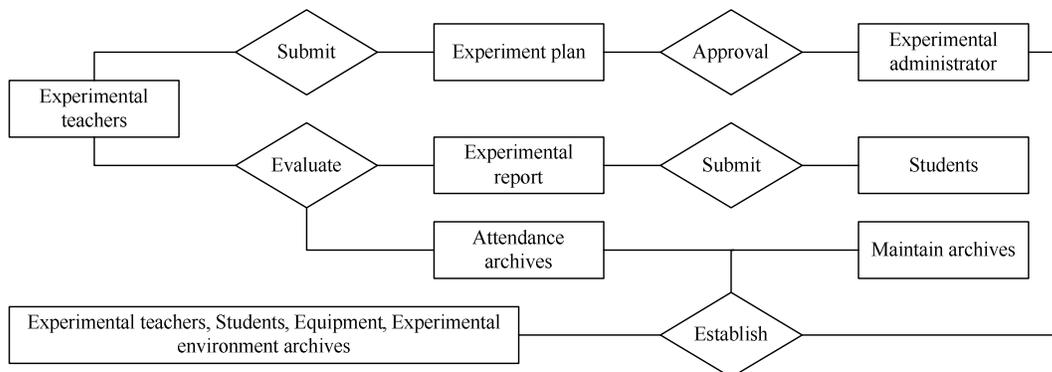


Figure 4 : Global E-R diagram of database

The database contains entities involved in Figure 4, and the contents of each entity are not described in detail in this study, but in each entity, there are the codes of two entities to which we need to pay attention. The first is the code of device. Because the device shall not only be provided for laboratory use, but also be subject to registration in fixed assets with the equipment department, this code is directly aligned with the code of fixed asset so as to facilitate the inquiry and registration of equipment. The second is the code of experiment plan, which code needs to take full account of the laboratory management requirements, including code contents of experimental time, classes as well as curriculum and instructor.

PLATFORM IMPLEMENTATION

The design of platform in this study uses C# language, and is built based on the distributed application architecture of .NET component. It consists of two components and six modules, among which the two components are system logon components and data access components. Components are displayed in ASPX page through C# source file.

Implementation of key technologies

In this design, the realization of public data component is critical, since this component shall achieve the data validation and data access functions. This component itself should include four types and two additionally written types, among which the AssemblyInfo.cs class the component itself contains is used to specify the program version information, which will not be repeated in this study.

ShareFunction.cs class contains some commonly used functions and methods, which are mainly used for the package, and its code is as follows: the code is relatively simple in the interface implementation. In the ASPX page display, it contains an export button, and can directly call this type, in order to achieve the export of database backend data.

```
Public void ExportExcel(string FileName,string Title,string FieldNameCH,string FieldNameEN,DataGrid Dg,Page page){
string[] FieldNameCHs=FieldNameCH.Split( ',' );
string[] FieldNameENs=FieldNameEN.Split( ',' );
SpreadsheetClass xlsheet=new SpreadsheetClass();
DataView DV=(DataView)Dg.DataSource;
xlsheet.ActiveSheet.Cells[1,1]=Title; //Fill in the title
for(int i=0;i<FieldNameCHs.Length;i++){ //i, Position of control column
xlsheet.ActiveSheet.Cells[2,i+1]=FieldNameCHs[i];
for(int j=1;j<DV.Count;j++){ //j, Position of control line
xlsheet.ActiveSheet.Cells[j+2,i+1]=DV[j][FieldNameENs[i]].ToString(); //Fill in the cell
}
}
}
```

Validator.cs class and ErrorMessage.cs class is mainly used for data verification, in which ErrorMessage.cs class is a virtual data table to store error message, and this error message mainly refers to the message when the ASPX page has error. This data sheet is provided with a total of three virtual fields, including item name, item value and error message for the purpose of inspection data. The error message is returned through this class, and the code is as follows:

```
//Function Description: When checking the data item, an error message is returned by such classification
Public class ErrorMessage:DataTable{
public const string MainCaption=" MainCaption" ; //Name of validated project
public const string ValidateValue=" ValidateValue" ; //Value of validated project
public const string ValidateMessage=" ValidateMessage" ; //Error message
public ErrorMessage(){
this.TableName=" Validate" ; //To structure the calibration table object where the validation results are stored
DataColumnCollection DCC=this.Columns;
DCC.Add( "MainCaption" ,typeof(System.String));
DCC.Add( "ValidateValue" ,typeof(System.String));
DCC.Add( "ValidateMessage" ,typeof(System.String));
}
```

The need to write your own DataBaseClass.cs class is to go from a database connection string; SqlOperationClass.cs class is used to encapsulate the method of operation of the database. I have written these two classes function is used to enable access to the database.

Implementation of module element

Design of platform in this study contains six modules. Due to space limitation, the thesis only describes the implementation of attendance module. In the design of platform, the module is divided into four layers, and contents in these four parts are reflected in the form of separate folder on explorer of .NET development platform. Each management

component in each module consists of four layers. Taking the attendance register in attendance module for example, the performance of the four layers are reflected as registered business, check of registration business, database statement generation of registration business, and the object entity of registration business entity data. Among them, the registration business class is interface of data in the accessing database, and it encapsulates three properties. The use of this class can achieve access to the database, and can call the other three categories; check class of registration business also provides four methods to check the package returned back to the business rules in registration business class; database statement generation class in registration business class also provides four methods, which takes the generated by the database statement as a string to return to registration business class; object entity class of registration business data is the new virtual table created in the virtual dataset, which is used to temporarily store data. The table contains the corresponding table field in the database, and we can add the attribute of table as needed by data entities at any time.

This four-layer class relationship can be represented in Figure 5.

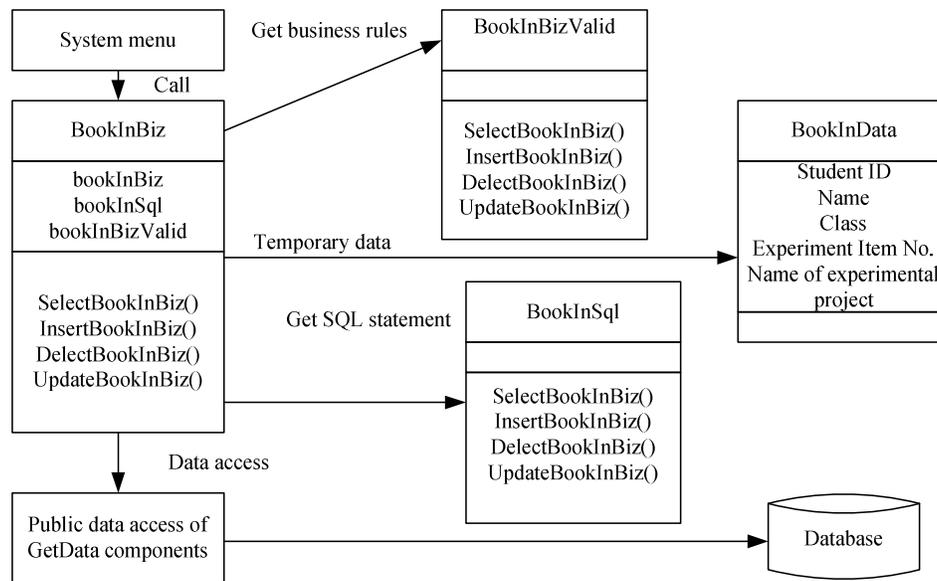


Figure 5 : Relationship diagram in attendance business register class

CONCLUSION AND PROSPECT

This study is in the environment of the rapid development of computer technology and communication technology. In order to change the majority of university's the rough and backward management, with access to relevant information and combined with management experience in a number of institutions, this study makes complete demand analysis on the computer lab. On the basis of the demand analysis, it determines the platform entity and realize the entity by reflecting in the database. With the final use of C# language and .NET component-based distributed application architecture, we build a computer lab archive-based platform. This platform consists of two components and six modules, which is displayed through C# source file in the ASPX page, and featured by the intuitive interface and easiness to operate. The platform has completed the two parts of important contents for the first designed parts, and achieved business process from the perspective of teaching managers and its support process, including experiment plan, attendance, analysis report, equipment, maintenance and system management, a total of six modules. Each module also contains three components, which can meet fully satisfy the implementation of daily management functionality of computer lab. It can liberate lab manager from the tedious work, and building this system can allow standardized and systematic collection, collation and storage of various files of experiment management, and integrate these files to reach data sharing among different administrators and different departments, basically achieve the desired goals, and ensure the normal operation of the computer lab daily management.

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