Application Analysis of Computer-aided Information Technology in Automatic Assignment and Reservation of Ping Pong Tables in Universities

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Abstract

A society develops with the development of information technology (IT). Despite the increasing number of materials and category complication, computer-aided IT has provided much convenience for material management and assignment. With computer-aided IT, this study aims to achieve the automatic assignment and reservation of ping pong tables so as to improve the convenience and utilization efficiency of material assignment. In combination with a database for data storage, ping pong table information is preprocessed (including classification and merging). C# programming language is utilized for system design in combination with an SQL server database. A program is compiled to display the design result and thus complete the automatic assignment and reservation of ping pong tables.

Keywords: Computer-aided information technology, Automation, Assignment, Application

1 Introduction

Computer-aided information analysis is a widely applied technology that developed gradually from the 1970s with the progress of information technology (IT) and the development of science and technology [1]. With the progress of societies, more and more production and life processes have become inseparable from IT. Computer-aided IT can significantly improve information processing, analysis efficiency, and the overall technology. The emergence of computer-aided IT was first observed in the demand for analysis methods and theoretical research [2]. With the development of societies, data volume has increased rapidly and has made information collection, processing, and analysis boil down to research on processing and analysis methods for complicated data.

The traditional data processing method introduces many parameters and equations in the processing of complicated data and entails an increasing amount of difficulty in modeling and solving [3]. Thus, a traditional manual solution cannot meet the requirements of scientific and technological development. Meanwhile, science and technology have progressed and have become mature with computer technology [4]. Information-aided IT gradually developed, and support and connection to databases and multi-party software have gradually increased [5]. Meanwhile, computer-aided IT can also mine and combine added information and can further process the data, which greatly improves traditional manual work [6]. After the initial auxiliary data processing, system support, multifunctional development, data warehouse, data mining, mass data processing, and so on are organically combined with computer-aided IT to assist in complicated work processing and material management and contribute to senior decision making to achieve high-grade IT service and application [7]. With the development of computer technology and the progress of societies, the types and number of materials have increased continuously [8]. Managing large amounts of complicated materials manually is difficult. Through networks, computer-aided IT has been blended into various aspects of life, including traffic, education, science and technology, and shop management. With the increasing complication, material management and assignment have gradually eliminated purely manual work. Computer-aided IT is now utilized to significantly improve efficiency. Computer-aided IT continues to manifest more and more important statuses and roles [9].

Many types of materials exist in universities. Sporting goods and others are upgraded and used frequently. For example, indoor ping pong tables in universities have a high utilization rate. Manual assignment and reservation of these tables are complicated and could easily cause errors. To date, no ideal indoor ping pong table automatic assignment and reservation system has been established. On this basis, a method to achieve this application function is investigated in this study. Several feasible plans are proposed.

2 Composition and process of computer-aided IT

Current computer-aided IT mainly consists of a database, an analysis method, software, and an individual. Combination with a database can effectively manage and combine data with a follow-up algorithm. Many analysis methods are available, and selecting an appropriate algorithm and processing method can be of great help to the follow-up processing. Software is another important tool in IT. It can facilitate the work of processors, especially in the original software-based secondary development. The individual is

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the server and user of IT. An individual is subjective in algorithm selection, database selection, data processing, and application direction. The main work process is shown in Figure 1.

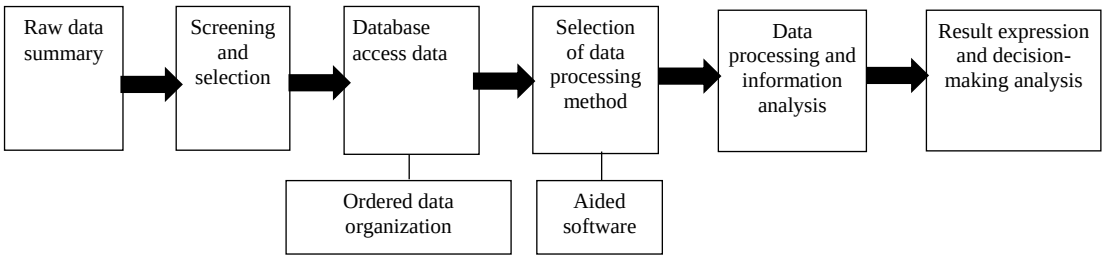

FIGURE 1 Flowchart of computer-aided information technology

As shown in the flowchart, the data are screened first. Data with a significant error and unrelated to the research purpose are eliminated. The screened data are inputted into the database and preliminarily managed (merging and classification). Then, the analysis method, evaluation algorithm, and so on is selected according to the application purpose and development direction. In this stage, the subjective analysis of an individual is required. Based on the database data and with the support of the program algorithm, the information is analyzed and processed to obtain certain results; those that do not conform to the specifications are eliminated, the effective result is analyzed, and the evaluation result is utilized for decision making on the application direction.

3 Design of an automatic assignment and reservation system for indoor ping pong tables in universities

With indoor ping pong tables in universities as the research target, computer-aided IT was used for the design of an assignment and reservation system for ping pong tables. The system structure is shown in Figure 2.

Users can input their student/employee ID and password to log in to the system. The database then identifies the identification information data; if such information exists, the login is successful. Two processing methods are employed. The first one is to directly input the reservation time for reservation. If conflict exists between the inputted reservation time and others, the remaining spare time can be utilized or a user may inquire whether the current users need to reserve the following spare time. If no conflict exists in reservation time, information, such as the number of reserved tables, is assigned at random. The other method is to directly request for reservation information of that day and select and reserve freely according to the reservation schedule displayed; this method provides more freedom to users in terms of selection.

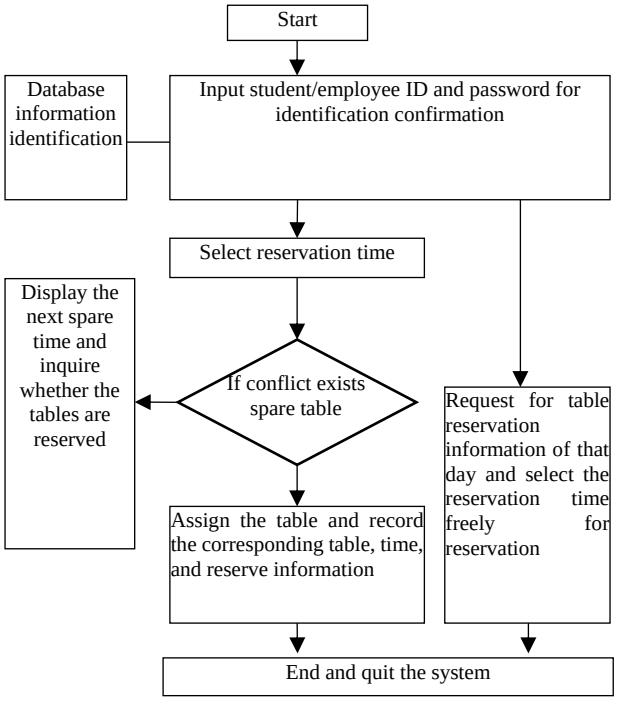

TABLE 2 Overall design flow

3.1 CODING METHOD FOR COMPUTER-AIDED INFORMATION

Given the large number of ping pong tables and complicated information, the use of an effective coding form is important. However, manually compiling information codes can cause errors and is tedious to maintain. Computer-aided coding can ease the coding process through computer-aided IT, reduce the amount of manual coding, and increase the correctness and reliability of coding.

The coding types of ping pong tables can be classified into the following.

(1) Variable: such types of codes represent data codes that are usually changed and are utilized to calibrate the variables in the data, such as student ID and teacher number.

(2) Constant: such types of codes are constants with a certain length; they are generally utilized to express unchanged data information, such as table and region numbers.

(3) Serial number: these numbers are of increasing volumes according to a certain sequence; they are used to express certain serial information and can be utilized to express data with similar characteristics and sequences in a certain range (e.g., table reservation time and starting and end time of use).

According to the actual data storage method of ping pong tables, we can adopt the database model shown in Figure 3 (addition and modification are available for this model based on the specific use condition).

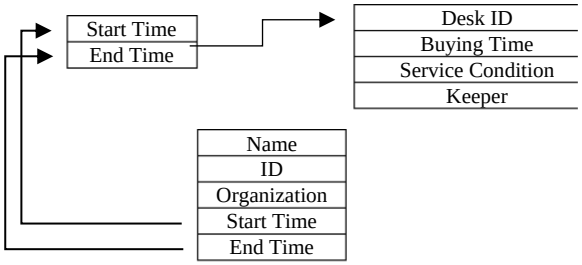

FIGURE 3 Schematic of the database model.

According to the above design, the use conditions of tables are determined by name, student/employee ID, reservation start time, reservation end time, and table number. If other purposes are required, addition and modification can be implemented on this basis.

3.2 DATABASE INFORMATION MANAGEMENT METHOD

To achieve automatic database data management, operations, such as automatic addition, assignment, and display, must be implemented in combination with computer technology to improve the warehousing and warehouse-out efficiency and reasonably arrange the use and spare time of the tables. During management, the foll T_{start}, and the end time is T_{end}. If the reservation time is set to t_s at the beginning, the end time is t_e.

3.2.1 First come, first served

When distributing ping pong tables to numerous persons simultaneously, the time and sequence of each person must be arranged. Those who reserve first should be served first, and the assignment task and time sequence are combined. If all tables are not empty within a period, the reservation time can be expressed as

$$t \in \{t_s \le T_{start},\ t_e \ge T_{end}\}$$

3.2.2 Task combination and filling mechanism

After the persons leave table, i.e., after completion of information warehouse-out, the next group of tasks can fill in the blank to reduce the spare time and improve use efficiency. This procedure is based on the sequence of reservation time, and the time sequence is still the serial volume. At the end of reservation time, the follow-up tasks can be arranged, i.e.,

$$t \in \{t_e \ge T_{end}\}.$$

The automatic assignment and reservation of ping pong tables can also involve man–machine interactions for automatic manual selection according to the table information displayed. Overall, the tables are assigned based on the time sequence, and the arrangement of time and number of tables is the main point to be balanced and adjusted. Therefore, during the specific operation, the following two assignment methods are established. Whether an empty table is allowed is expressed with Boolean quantity isOpen. If the table is empty, the value is 1; otherwise, the value is 0.

3.2.3 Random assignment

When many tables are empty during a period, the tables can be assigned in random mode. If

$$Isopen \ne 0$$

exists, we add

$$t_s = T_{start},\ t_e = T_{end}.$$

3.2.4 Designated assignment

Designated assignment means to assign the designated tables. Designated assignment is performed when many time conflicts and only a few empty tables exist. When the reservation time of two persons is in conflict and no more empty tables exist, the assignment is sequenced according to the log in time for reservation; those who log in first will be assigned first. The system selects the number of remaining tables, the next spare time, etc. It also selects the information of tables to be reserved manually.The final information table is shown in Table 1.

When managing the data, the table information is first inquired within the reservation period. If empty tables are available, the system assigns a table to the person at random and records his or her ID number, reservation start time, reservation end time, and table number in the database. If no empty table is available, the system displays “no empty table” and shows the next time with an empty table for manual selection. The arrangement of reserved tables for that day can also be inquired to adjust the time arrangement.

TABLE 1 Ping pong table reservation information table

Field name	Data type	Length	Whether empty is allowed
Name	varchar	100	No
Student/ employee ID	Int	50	No
Start time	Datetime		No
End time	Datetime		No
Table number	Int	20	No

Traditional ping pong table assignment and reservation are completed manually and unavoidably cause time conflict and table idleness. Consequently, inconvenience and the amount of work for the staff increase. A database system for the assignment and management of many materials can be utilized to reduce the amount of work for the staff and improve the utilization efficiency of materials. To facilitate the use of sporting goods by students and teachers, strengthen the management of indoor sporting goods, and improve the automatic assignment and reservation efficiency of materials, a university indoor ping pong automatic distribution and reservation system is designed in this study. The following paragraphs provide an

introduction to the work process and design of this system.

3.3 SYSTEM ANALYSIS AND REALIZATION

3.3.1 Automatic assignment of ping pong tables

The automatic management of tables requires mutually connecting the system program with the database. The main automatic assignment process is shown in Figure 5.

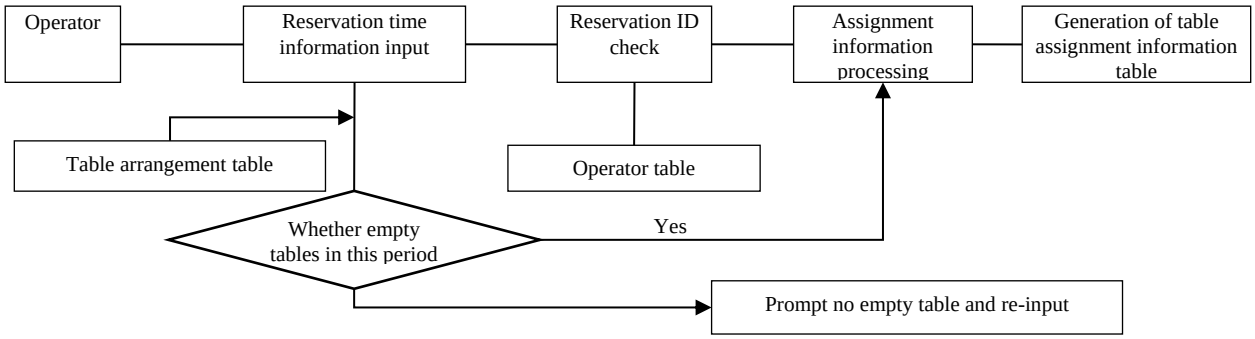

FIGURE 5 Flowchart of automatic table distribution.

The operators input the time interval to be reserved. The system automatically searches whether an empty table is available during this time interval. If a table is available, it is assigned to the subscriber at random. The table and subscriber information are recorded. If no table is available, the system displays “no empty table” and does not assign a table but makes the subscriber select another time interval. The page is then diverted to the functional link of table reservation.

Table automation does not only depend on the database. The database needs to be blended into the system environment, i.e., the SQL statement needs to be blended with the C# statement. When calling the database for data processing, the system needs an ADO module.

An ADO module is a module utilized to access the database; it can access and process database data conveniently. The main utilization process is shown in Figure 6.

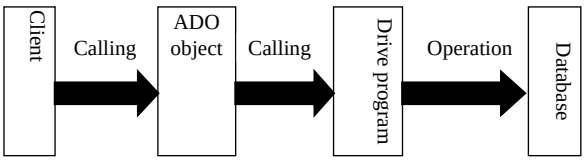

FIGURE 6. ADO flowchart.

This method is employed to achieve the automatic distribution process in Figure 5. When C# programming statement is utilized to connect the database, objects, such as Connection, Command, and Read, in the ADO module are used for the operation

```
//Establish SQL Server database connection
    string strConn =
"Provider=SQLOLEDB;Server=" + strServer +
";Database=" + strDatabase + ";Integrated
Security=SSPI;";
    OleDbConnection odcConnection = new
OleDbConnection(strConn);
odcConnection.Open();// open the link
    return odcConnection.Compared with other
```

programming languages, C# is more convenient for interface design and database connection and is quite intuitive and easy to understand for the compilation of the interface response function, which is highly beneficial for the initial design and follow-up optimization of the programmer.

The information in the research database is first inputted manually to generate a data sheet. The program is achieved with C#, SQLServer 2008 database management system, and Visual Studio 2008 compiler.

```
//Data in the database sheet are stored in the buffer
with DataSet method
OleDbCommand cmd1 = new
OleDbCommand("SELECT * FROM " + strTrajTable1,
odcConnection);
OleDbDataAdapter adapter1 = new
OleDbDataAdapter(cmd1);
DataSet ds = new DataSet();
adapter1.Fill(ds, strTrajTable1)
//Calculate time length information
relationship1 =
Math.Min(Convert.ToDouble(ds.Tables[strTrajTable2].R
ows[t]["Timestart"]),
Convert.ToDouble(ds.Tables[strTrajTable1].Rows[t +
1]["Timeend"]))
/
Math.Max(Convert.ToDouble(ds.Tables[strTrajTable2].R
ows[t]["SPEED"]),
Convert.ToDouble(ds.Tables[strTrajTable1].Rows[t +
1]["SPEED"]));
//Add data to the database
AddDataPredictionResult(odcConnection.CreateCom
mand(),strDataPredictionTable,Convert.ToInt64(ds.Table
s[strTrajTable2].Rows[t]["LINK_ID"]),
Convert.ToInt64(ds.Tables[strTrajTable2].Rows[t]["TIM
ESTAMP"]),PostAve,PostVar)
```

3.3.2 Ping pong table reservation system

Ping pong tables have a high utilization rate, and conflict will occur many times during system assignment. Therefore, manual selection according to the ping pong table reservation system is required. The main design process of

reservation is shown in Figure 7.

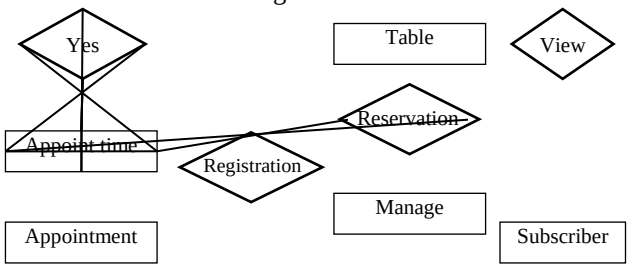

FIGURE 7. Design process of the ping pong table reservation system.

The subscriber can view the reservation time and time field of the entire day and then select the appoint time automatically according to his or her need. The system adds the operator's reservation condition to the final reservation condition table. This procedure significantly improves the humanization degree and intelligence of the system. The SQL statement is used during the insertion information operation as follows:

INSERT INTO table name VALUES (value 1, value 2, …)

Or INSERT INTO table_name (Column 1, Column 2, …) VALUES (value 1, value 2, …).

C# was utilized in this study for database connection and SQL statement blending. Thus, the readability and applicability of the statement are improved, and inquiring through the program is made more convenient. In addition, the operator can better operate and modify the program.

```
OleDbCommand judge = new OleDbCommand();
judge.Connection = odcConnection;
OleDbCommand cmd = new
OleDbCommand("SELECT * FROM " + TableName,
odcConnection);
```

Then the Insert to language of SQL is used to add the final result table data to the database, and also SQL language is blended with C#:

```
odbCommand.CommandText = "INSERT INTO " +
strTableName +
"(LINK_ID,TIMESTAMP,AVE,VAR)"+ " VALUES ('"
+ nLinkID.ToString() + "','" + nTIMESTAMP.ToString()
+ "','" + fPostAve.ToString() + "','+ fPostVar.ToString() +
"')";
odbCommand.ExecuteNonQuery();
// Execute insertion operation
```

All codes are completed in C# environment.

4 Conclusions

Sporting goods and materials in universities are used and updated frequently and upgraded rapidly. Hence, manual management is difficult and easily causes errors. An accurate and efficient sporting goods management system is significant for the efficient utilization of such goods.

With indoor ping pong tables in universities as an example, an automatic assignment and reservation system for ping pong tables was developed in this study. The system was established with computer-aided IT to reduce the amount of manual work. Program design was used to investigate computer-aided information coding in terms of automatic material distribution to improve the convenience and utilization efficiency of material assignment. In combination with a database for data storage, the ping pong table information was preprocessed (including classification and merging). C# programming language was utilized for system design in combination with an SQLServer database, and a program was compiled to display the interface design result and complete the automatic assignment and reservation of ping pong tables.

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