Research and Design of an Agricultural Scientific Instruments Classification and Code Management System

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Abstract. As China enlarged the investment in agriculture, the agricultural scientific instruments promoted rapidly. It required us to face the questions scientifically such as the procurement, management, resources sharing, evaluation and etc. in agricultural scientific instruments. Because of the lack of unified classification and code standards, it greatly limited the scientific procurement, efficient management, resources sharing evaluation in agricultural scientific instruments. Therefore, the existing classification and code standards cannot meet the demand also. This paper studies and develops the agricultural scientific instruments classification and the code management system based on B/S (Browser/Server) structure and ASP.*NET* technology. The database used the Microsoft SQL Server, the Server application used C#， the browser based on XHTML + JavaScript. This system on the basis of database, realized the inquiring mode in the fuzzy sense of four kinds of different ways to query data in agricultural scientific instruments. And it also supports the Chinese character automatically converts spell brief-code etc. This system has a significant effect on agricultural science instrument information management and sharing .It helps to improve the assets utilization rate and can regulate the state-owned assets management system also.

Keywords: instruments, agriculture, information systems, Browser/Server model

1 Introduction

The agricultural scientific instruments development has four notable features：Firstly, the amount is large. The total industry demand and the total agricultural scientific instruments quantity are huge. It had been increased on agricultural scientific instruments investment in recent five years. The constructive agricultural financial investment funds had invested 60% of the agricultural scientific instruments[1]. Secondly, the range is complete. Modern agriculture is a complex system, covering a complete range of equipment which involved in complex and diverse. It is related to heat, electricity, light, chromatography and other large instrument[2]. Thirdly, the agricultural scientific instruments developed rapidly. According to statistics, the instruments imported about 20 billion totally from 2008 to 2009, of which, the agricultural scientific instruments occupied a large proportion. The agricultural scientific instruments presented a quick development[3]. Fourthly, the feature is distinctive. The agricultural scientific instruments fully embody agricultural characteristics, the instruments and equipments covered a multitude of special features. For example, canola speed measuring device,

pesticide residues speed measuring device[4]、yellow aspergillus toxin speed measuring device, etc..In Chinese agriculture application, the speed measuring device provides the necessary technical support by preferential agricultural policies. It is a prominent characteristic. Due to the four characteristics of agricultural scientific instrument, it put forward the new age for purchase and management.

This paper will combine the agricultural industry business with modern high-tech information services to realize the agricultural scientific instruments name and classification code fast converting speed, apparatus, the ownership of the classification of quick inquiry. Greatly improved the agricultural scientific researchers work efficiently.

2 Research status

Because of lacking the unified classification and code standards in agricultural scientific instruments, it greatly limited the agricultural scientific instruments procurement, scientific efficient management, sharing and evaluation. The nation invested vastly in agriculture in recent years. The rapidly investment mainly reflects in the level of the instruments. Since everyone lacks of common standard in agricultural scientific instruments classification and code, and a similar instrument used in the different studies, may name differently. The direct result is each individual experts should have a very high professional judgments in the project review process. Also it brought a series of problems. For example, if the government investment grasp accurate? Is it efficient? Whether embodied the instruments value in the research front-line? It lacks of a unified evaluate judgment. According to the purchasing items of Chinese Academy of Agricultural Sciences from 2006 to 2010, the annual funding for the purchase instruments had more than 150 million RMB, and it had gradually increasing year by year. It also had a lot of difficulties in sorting out, managing and evaluating all of these instruments. A lot of instruments cannot manage in information, sharing the large instruments become impossibly. The lack of consistent classification and coding standards, became the bottleneck in agricultural scientific instruments for purchase, management and sharing[5].

The current classification and code standards cannot meet the agricultural scientific instruments procurement, management and evaluation of demand. In recent years, the national science and technology drafted ‘National classification and coding large-scale scientific instruments table’. In the investigation of the application, it for 500000 RMB of above large-scale scientific instruments are classified and coded. In agricultural field application, applying the classification standard, more than 80% of the agricultural scientific instruments are classified in the quality inspection instrument. It can not reflect the characteristics of agriculture. Agricultural research can not reflect the level completely. It should have no value reflect to come out. The classification standard cannot meet the agricultural field. In 1992, the environmental industry drafted environmental protection instrument classification and named standards, but the standard is simple relatively, which of instrument coverage is small. Therefore the standard cannot adapt to the information management needs.

3 System design and architecture

3.1 Agricultural scientific instruments classification method

The system uses the line classification, classification of agricultural scientific instruments, according to instruments type, characteristics and standard. This system is divided into categories of agricultural instruments, categories, sub-category, groups and type of four levels. In the hierarchy, it is divided into the categories of upper class, which divided into the categories of lower class. Directly into a category by the next level out of all kinds of projects, it known as parity class. As a kind of division, it is the same as a benchmark for parallel relationship between the classes. Lower class and upper class categories are subordinate relationship. As a kind of relationship, it sort between not cross, cannot repeat, and only the upper class. Classification in turn, should free layer or additional layers.

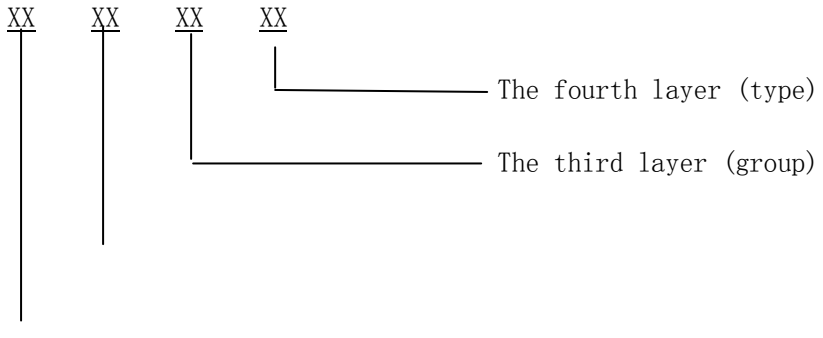
The first level instruments of 'category' with the first, second digital code, the second level instruments of 'sub-category' with the third, fourth digital code, the third level instruments of 'group' with the fifth, sixth digital code, the fourth level instruments of 'type' with seventh, eighth digital code.

3.2 Agricultural scientific instruments coding method

According to the current and to be used in quantity of agricultural scientific instruments, it determined by each level two digital code, a total of eight digital level the code structure. Its classification structure shown Fig. 1.

The system of agricultural scientific instruments is used in line classification, at a higher level on each class (group), it only contains all of the following lower-level classes (groups). The code base is each level differences between the characteristics of the object. It is incompatible features on each level. To lower level code is actually higher levels the code and low levels of the code composite code. The third and fourth layer is no longer sub-classification, in its code up '0' until the eighth. To meet the agricultural scientific instruments enlargement ductility and coding extensibility principle, each layer classification of all equipped for the item, asylum has not been listed s to code 99.

For agricultural machinery classification method directly used for in 'NY/T 1640-2008 Agricultural machinery classification[6]' standard of classification method and the classification number. In this system, the second layer of sub-categories of agricultural machinery with the classification code in the same category code. The third layer group classification of agricultural machinery in the last two class code is consistent. The fourth layer type code and classification of agricultural machinery in the last two items is the same code. Tropical crop of mechanical classification method directly used criteria of 'NY/T 1560-2007 Tropical crops mechanical classification[7]' classification method . Code encoding method according to the coding system.



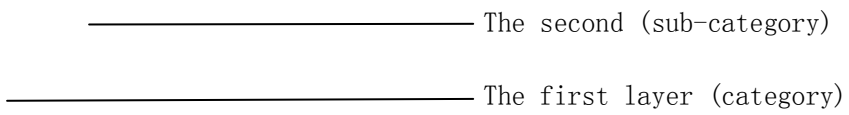


Fig. 2. Coding structure schematic drawing

3.3 System implementation

System design. Microsoft.*NET* is to support a new generation of Internet platform. The.*NET* Framework is the foundation of the.*NET* platform, which provides integrated development environment. It uses VB.*NET*, c # or Jscript.*NET* programming language to realize the middle three-layer structure (business logic layer) design, namely using the ASP.*NET* presentation layer to complete the design[8]. The .*NET* development platform application created in Common Language Runtime environment bottom CLR control operation. It is used to load the application, make sure they cannot wrong to perform for the corresponding safety license application, verification, and implementation in operation, finally the completion of the wash them away. Class library provides that applications can be written XML data, on the Internet communications, such as access to database code[9].

In considering the system requirements, the user acceptance and research foundation, after this study adopts the current application extensive Windows Server 2003 +.*NET* + Microsoft SQL Server 2005 system. As for data management and information service network system, and its structure using Browser/Server mode is the best choice. Not only convenient for users to use, but also saving a lot of development and operation of investment. For different needs, it based on the underlying database query detailed information model. In the development process, highlighting the technical characteristics of humanity, it is from the perspective of user-friendly features and interface design.

System architecture. Agricultural scientific instruments classification and code management system structure using current applied widely and technology mature Browser/Server mode. If there is Internet access and a browser installed on the computer, this mode can be any user data access and query, which it is the biggest characteristic. Comparing client /server mode to Web page instead of the client software, it is the so-called ‘thin client’. Which does not require client software maintenance and upgrades, there is no cross-platform issues. Thereby reducing the burden of agricultural research workers, reducing the cost of data maintenance, but also it makes any changes, effective immediately, to ensure information timeliness, accuracy and completeness[10]. Provide data query, the server program run by the router and the network firewall connected to the Internet, through the access Internet users of computer, login inquires the interface to access and data query. In the function, the information system have three layers of logical structure, including the presentation layer, function and data layer. As a result of a three-layer structure, it is making the deployment, maintenance and upgrades easier and flexible. As shown in Fig. 2. is the main function modules of the system. This system contains query, demonstration and maintenance three function modules, which the query module mainly focus on the serial number query, the spelling query, the category query and the name query. Maintenance module contains the users to access classification management, instrument code entry, instrument code ownership by category and sub-category, etc.

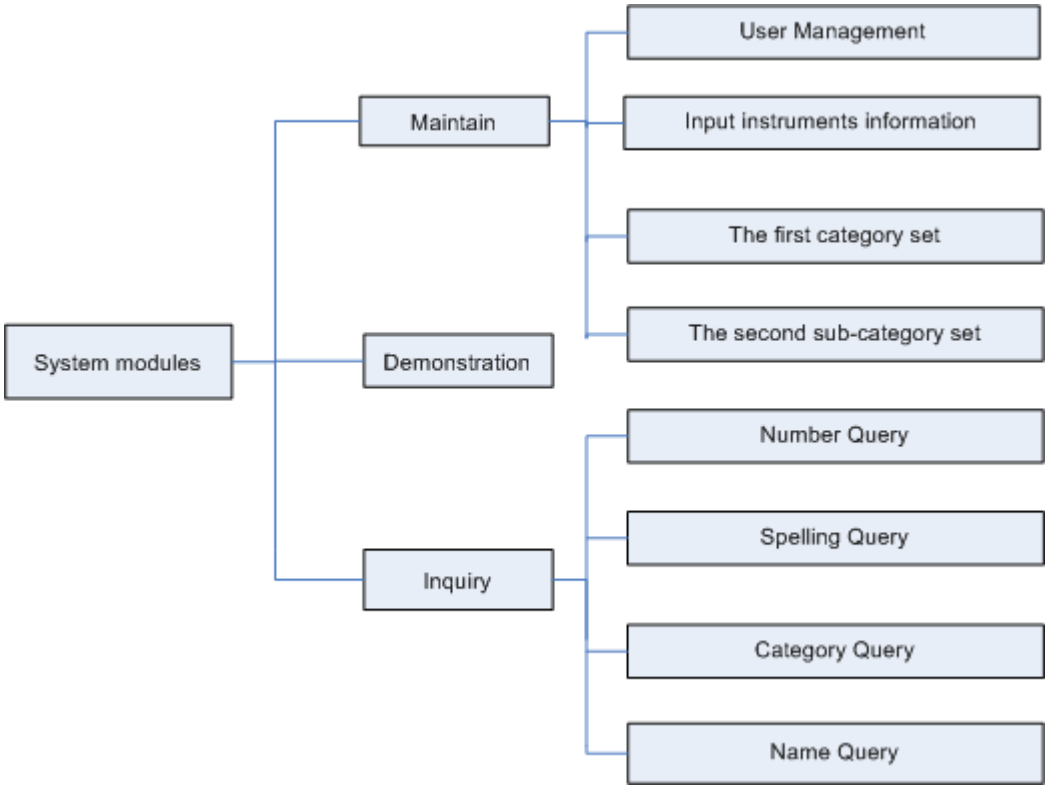


Fig. 2. System Diagram

4 Development operation environment

4.1 Hardware environment

An IBM X3650 servers and their associated system of the support system run the hardware environment. The IBM X3650 server have double road Intel Xeon E5606 four nuclear CPU, 2.13 GHz frequency, 4 GB DDRII double channel memory, 146 G hard disk storage system of SAS server, double 1 000 M network adapter.

4.2 Software environment

Development platform. In Windows XP operating system environment SP3, it use Microsoft Visual Studio 2005 and AdobeDreamweaver CS3 as a development platform. The system had written the XHTML, JavaScript code for browser and the ASP.*NET* (C#) language for server code.
Release platform. In Windows Server 2003 Standard Edition operating system environment, it uses IIS as the HTTP server to handle static HTML page views. By the ISAPI server extension called server program, and operation results returned to the client browser in the form of static HTML. Server run in the Microsoft.*NET* Framework 2.0 class library, through the SQL Server Authentication visit Microsoft SQL Server 2005 database Server.

5 Key algorithm

5.1 Agricultural scientific instruments names fuzzy query

Normally it used the SQL statement inquires the text fields, in both sides of the query add '%' wildcard, reoccupy 'LIKE' operator perform a search. However table 1 agricultural scientific instruments classification naming is very complex, and usually the inquires the strategy may produce user input contents leak check or the name of the error types. Therefore this study had developed an agricultural scientific instruments name fuzzed algorithm. The algorithm of the operation process: 1) Pretreatment: It remove the input string without actually meaning characters, such as space, parentheses, '-' and '.' ; 2) Digital processing: It analyze string is involved in Chinese or Arabic Numbers, if have, to the Chinese and Arabic Numbers exchange; 3) Fuzzy treatment: It mask '%' insert into the query string and the end of the characters, thus finish and between the whole fuzzed process. Compared with the usual inquires the strategy, this algorithm is characterized by be inserted into the wildcard between each character, in order to adapt to all kinds of complicated instrument name. Combined with pretreatment and digital processing, this algorithm can successfully lookup table 1 listed in the various types, which can effectively improve inquires the efficiency, reducing leakage and the chance of error.

Table 1 Agricultural scientific instruments classification code

Classification code	Agricultural scientific instruments
70070205	Meteorological satellite issued equipment ground station
70070206	Meteorological satellite receiving equipment ground station
70070207	Meteorological satellite data collection equipment ground station

5.2 Chinese characters automatically converts spell brief-code algorithm

Agricultural scientific instruments classification and code management system database saved thousands of instruments information. The code name translation is one of the important functions. In common Chinese text query string is the input of Chinese characters, but this method requires too many keystrokes. For example, inquires the instrument for 'Meteorological satellite issued equipment ground station' in Chinese, need the Chinese input method input 'qixiangweixingdimianfabuzhanshebei', keystroke at least 34 times, the efficiency is low. The Chinese method of brief-code inquiry can effectively improve the speed of information retrieval equipment. Brief-code is the first Chinese spell brief-code. For example, the same 'Meteorological satellite issued equipment ground station' inquiring record, brief-code inquiring the only need to enter 'qxwxdmfbzsb'. Example shows that the use brief-code inquires to target records quickly, reducing keystrokes, greatly improving the efficiency of query. Then the system uses fuzzy inquiry method. Actually using, you input 'qxw' three letters can quickly lock inquiring the instrument of the relevant information.

The following are Chinese characters automatically converts spell brief-code algorithm.

```
// Create two different encoding object
Encoding unicode = Encoding.Unicode;
// Create GBK code object
Encoding gbk = Encoding.GetEncoding(936);
// Unicode string will be converted to bytes
```

```
        byte[] unicodeBytes = unicode.GetBytes(UnName);
        // Conversion for GBK code
        byte[] gbkBytes = Encoding.Convert(unicode, gbk, unicodeBytes);
        while (i < gbkBytes.Length)
        {
            // If for digital \ letter \ other ASCII characters
            if (gbkBytes[i] <= 127)
            {
                strResult = strResult + (char)gbkBytes[i];
                i++;
            }
           //Otherwise the generation of Chinese spell brief-code
            else
            {
                key = (ushort)(gbkBytes[i] * 256 + gbkBytes[i + 1]);
                if (key >= '\uB0A1' && key <= '\uB0C4')
                {
                    strResult = strResult + "A";
                }
                else if (key >= '\uB0C5' && key <= '\uB2C0')
                {
                    strResult = strResult + "B";
                }
                else if (key >= '\uB2C1' && key <= '\uB4ED')
                {
                    strResult = strResult + "C";
                }
                                        

                else if (key >= '\uD4D1' && key <= '\uD7F9')
                {
                    strResult = strResult + "Z";
                }
                else
                {
                    strResult = strResult + "?";
                }
                i = i + 2;
            }
        }//end while
        return strResult;
    }
```

6 Conclusions

The agricultural scientific instruments classification and code management system will solve the problem of lacking of unified classification and code standards in agricultural scientific instruments. For the convenience of the user's query information and sharing instruments, this study researched and developed the knowledge on the fuzzy query and the Chinese characters. It improved the efficiency of agricultural scientific instruments inquiries, the agricultural scientific instruments' name fuzzy query and Chinese characters automatically converts spelling brief-code algorithm, it also reduced the rate of false query check and the chance of leakage. It is the function of the realization of a certain innovation. The system regulates the flow of agricultural scientific instruments and procedures to share. Thereby it reduced the ambiguity due to the non-standard users information, and it can save the research costs, reduce the unnecessary wear and tear. The current agricultural scientific instruments will be further developed and improved in integrated information systems and the intelligent direction. It will distribute a bar code for each scientific instruments in future, and continue to develop the low-cost hand-held mobile terminals. The bar code scanning equipment can check the information and classification as soon as possible. Thus to reach the aim of sharing the equipment effectively.

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