Design and Implementation of English Online Examination System Based on QT

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Abstract. With the development of society, all fields will basically involve examinations. Nowadays, most of the papers in the form of paper media are used for examinations. The examination of paper media is heavily dependent on wasting natural resources and is difficult to improve efficiency. For these reasons, the extensive use of test software is essential. The design and implementation of the text is based on the C/S mode exam management system. The system sets different permissions for each user category. People of different privileges use different functions. The system displays all the functions of the examination on the client, realizes the difference of information sharing and processing in real time, reduces the influence of human factors on the fairness of the examination, and greatly improves the efficiency of the examination.

Keywords: Online test, examination system, QT, C++

1. Introduction

At present, all sectors of society require talents, and one of the most important ways to select talents is examinations. Most of the school's non-computer courses exams are traditional paper media examinations. Employers' examinations are similar. The difference is only the identity of the test taker. One way to do this is to bring tedious workload to schools and employers, which is not conducive to improving the efficiency of recruiting units. With more and more types of examination and ever-increasing examination requirements, the traditional examination method of paper media has been unable to meet the needs of current examination work. In today's society, computers are becoming more and more widely used[1]. With the continuous development of network technologies, online examinations using computer technology for paperless office are urgently needed[2]. For schools, this not only eases the workload of the school, but also improves the efficiency of the examinations conducted in response to student learning, which also improves the quality of the exam. This makes the selection and testing of examinations more accurate, fair and objective[3].

Although there are many computer aided examination systems, they all have the characteristics of platform dependence and module coupling. With the increase in the number of computer software and hardware platforms, the need for test systems to cross-platform features and the stability and high efficiency brought about by the low coupling has become urgent. Therefore, this paper proposes a design and implementation scheme of a cross-platform computer-aided English exam system based on
the QT development framework[4]. Firstly, cross-platform software can be developed based on the QT development framework to realize the cross-platform features of the invigilation system. Secondly, in the process of design and implementation, attention is paid to reducing the coupling of software modules and ensuring the efficiency and stability of the invigilation system. In the end, although the invigilation system is used for English exams, it adopts object-oriented design[5]. The interactive module of the exam presents an exam as a subject, so that other exams can be smoothly performed on the invigilation system.

2. Related theories of education
The development of online examination system needs to follow the law of education and is based on the theory of education measurement and education statistics. The measurement of education can be divided into broad sense and narrow sense. In a broad sense, educational measurement generally refers to the quantitative measurement of educational activities by means of measurement. The narrow sense of educational measurement refers to the quantitative measurement of students' knowledge, intelligence and personality according to certain rules and procedures. We usually refer to the narrow sense of education measurement. Examination is to be scientific and reasonable, in order to play its due effect[6]. The most important link and process of education measurement is the objective and quantitative analysis of the examination, and the considerable data analysis is used to replace the subjective judgment, so as to help understand the teaching situation or personal quality. In order to do this, we need online examination system to follow the law of education.

Educational statistics is the technical basis for scientific, reasonable and objective analysis of examination results. Through the examination, we can get a lot of data for statistics. It is not only a method to find out the objective laws of education, but also the core task of education statistics to sort out and analyze these massive data effectively[7]. The reliability, validity, difficulty and discrimination of measurement are related to the related concepts of statistics. If the difficulty of the test is too high or too low, the test results may be non normal distribution. According to the method of computer, when the score is skewed distribution, most of the scores are concentrated in the low or high segments, the difference between the distribution range and the score is very small, and the variance of the observed single score is also very small, so the reliability is low. Reliability is used to check the consistency of the two should be interrelated. A group of test questions can be randomly divided into two or more groups, and the contents and forms can be diversified according to the odd and even order or random order. The results show that the distribution of test scores is normal, the reliability of test is increased, and the scores are widely distributed. Difficulty refers to the degree of difficulty of examination questions. If all the questions are similar in difficulty and type, even if all the questions look similar. It is impossible to accurately detect the true level of each student. Therefore, we usually use several different groups of questions with the same difficulty, so that the knowledge level of each group of questions is the same. In order to measure whether the difficulty of each test paper can effectively make the test scores tend to normal distribution, we can divide the random test paper into several parts, and answer by different people or groups, according to the distribution of wrong questions of each individual or group

3. System architecture design
The method agent based on B / S structure can directly interact with the service source without the intermediate link of network transmission, which will significantly reduce the requirement of network bandwidth. Compared with C / S mode, it has less dependence on the network and does not need to keep the network connected all the time, which improves the utilization of the network. Agent technology can achieve parallel solution. In order to complete a task, users can create multiple agents and run on the same or different nodes at the same time. By using the parallelism of mobile agent, the load of a single node can be distributed to multiple nodes of the network, which makes the small system have the ability to deal with large-scale and complex problems. It breaks the traditional mode of network communication and overcomes the difficulties of developing application layer protocol in C / S
mode, poor expansibility and great limitations. Automatic test paper generation algorithm is a very important part of online examination system, including random test paper generation algorithm, fuzzy test paper generation algorithm, backtracking trial algorithm and genetic algorithm. The advantage of "backtracking trial" is that the test paper can be generated in most cases, but the disadvantage is that it takes up a large amount of computer system memory space and takes a long time to calculate. It is suitable for the case that the test paper generation conditions are not complex.

3.1 Introduction to QT

QT is a fairly mature standard C++ framework that is used for high-performance cross-platform software development. In addition to having an extended C++ class library, QT also provides a number of tools that can be used to write applications quickly. In addition, QT also has cross-platform capabilities and can provide international support, all of which ensure the wide range of applications of QT applications in the market[8, 9]. Since 1995, QT has gradually entered the business world, and it has become the foundation of thousands of successful applications worldwide. Whether it is multinational companies and large organizations, or numerous small companies and organizations are using QT. QT uses signal and slot mechanisms to make the written program easier to understand. QT is also the basis of the popular Linux desktop environment KDE (KDE is a standard component of all major Linux distributions. The functions of QT are comprehensive, providing consistent interfaces, easy to learn and use, which can lighten the workload of developers and improve the efficiency of programmers.

![Fig. 1. Structure of QT](image)

3.2 C/S structure model

C/S structure mode is a distributed computing mode. The C/S structure mode reasonably distributes the calculation and data of the application software to the Client and Server, which can greatly reduce the communication overhead of the system. The main task of the client is to create a user interface between the user (administrator, teacher, and student) and the server; submit a user's request to a database server; handle and need to return the data from the database server to the client's client side; use the client to carry out the person and the machine directly. The most basic is the "request/response" relationship: some of the client's information, data, operations, or data requests are sent to the server, and the service responds to its requests and completes Corresponding process, the result of the response is returned to the client again. The C/S structure mode consists of three parts: server, client and middleware. The server is responsible for the effective management and storage of various data resources, which can meet the needs of the database and ensure that the database is safe and stable to deal with the data.
3.3 QT database operations
SQL class is divided into three layers: (1) user interface layer. The classes that hold this layer include QSqlEditorFactory, QSqlForm, QSqlPropertyMap, QDataTable, QDataBrowser and QDataView. (2) SQL application programming interface layer. These classes access the database QSqlDatabase class used to connect to the database. In addition to the QSqlDatabase, QSqlCursor, and QSqlQuery classes, QSqlError, QSqlField, QSqlIndex, and QSqlRecord also support this layer. (3) Driver layer. The layer consists of three classes: QSqlResult, QSqlDriver, and QSqlDriverFactoryInterface can build database drivers from the QSqlDriver class. SqlDatabase specifies the instance drive or drive type, what type of database is allowed to access, and the name of the connection. Through its connection, we can manipulate the channel of database, create the default connection, and invoke the addDatabase () method. For example in a query to create, browse and retrieve data, etc. Can perform DDL (Data Definition Language (DDL) statements such as: search, add, delete, update and other functions.

4. System function design and implementation
The examination system makes the following design through the requirement analysis. The online examination system can be divided into two terminal programs: the teacher side and the student side. The teacher has the pre-test management, the initiation examination, and the post-test management function. The student end has exam, post-test management and auxiliary functions. The examination module in the examination system is the core module of the system[10]. The examination is completed by two different roles: teacher and student. The functional structure of the examination system is shown in Fig.2 below.

![Fig. 2. Functional structure of the examination system](image)

4.1 Teacher-side Function Design
After the teacher logs in to the system, he or she logs in to the teacher-side system and enters the pre-administration management module to add test questions and test papers, add different testers, and add information to the database before conducting the test. Teachers have the authority to organize exams. When there are questions and exam papers in the database, the teacher can initiate the exam. The teacher selects designated personnel to perform the test through the teacher's machine. The teacher can select the test paper, designate the person, specify the test time, and he can also force the test to end. They can log in to the post-exam management module for review, grade inquiries, and a series of operations. The specific teacher-side system flow chart is shown in Fig.3.
The test paper contains a certain number of different questions. Different difficulty levels, different test subjects, and different examination objectives can have different test papers. The paper management includes the addition, modification, deletion, randomly generated files, and import and export functions of the paper. The test system database stores a large number of test data. Authorized users (administrators, teachers), such as teacher users, can perform the above functions on the questions in the database.

4.2 Student-side Function Design
After the student logs in, if there is an exam, he will enter the exam module unconditionally, and other modules will not be available. He will reply to other functions when the answer is completed. When the
student answers the question, he can submit it. The exam ends when all participants submit, the test
time ends, or the teacher forcibly ends the exam. After the exam the papers will be uploaded to the
server. Teachers can intuitively understand the achievements of the students in the exam. Students can
access their exam results, but can't see other students' grades. At the same time, the trainee can check
the answer of the exam he has participated in and the standard answer of the examination paper. The
specific student-end system flow chart is shown in Fig. 4.

4.3 Main Program and Interface
The teacher’s login screen is shown in Fig. 5. This interface brings together the modules that teachers
need to use, including entering testers, entering test questions and papers, and starting tests.

![Teacher Login System Interface](image)

**Fig. 5. Teacher Login System Interface**

As is shown in Fig. 6, after the student logs into the system, he or she can modify personal
information, select to start the test, select the type of test subject in the Type, and the system will
display the test time and score. Below the question number is the title area. The following options are
available for candidates to choose. Candidates can also choose to answer questions on their own.

![Teacher Login System Interface](image)

**Fig. 6. Teacher Login System Interface**

5. Conclusions
This article uses QT cross-platform C++ graphical user interface application framework, designed and
implemented an online English test system. The system can be compiled and run on multiple platforms, and it is highly portable. The online examination system can pass the one-time or a few data records in the previous period and follow-up simple maintenance to achieve a more human and material assessment method, which is more efficient than the traditional examination. This system is bound to have extraordinary development in the pursuit of an efficient, low-cost, environmentally-friendly society today.

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