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Application Research of Web Examination System Based on College

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Abstract

Research and comparison for different web examination system in the current individual field, proposed a set of design mode about general examination platform which apply in colleges and universities, research and analysis the key technology, and proposed improved scheme, made system being perfect.

Keywords: web examination system; application research; design mode

1. Technologies Related to Web Examination System

1.1. Three Models of the Web Examination System

The current web examination system contains three models--B/S, C/S and B/S combined with C/S -- which have advantages and disadvantages as well. B/S is the popular N-Tier mode which is a three-tier architecture system. It bases on the web browser developing model of multi-tier structure. Comparing with C/S architecture, its main advantage is the zero maintenance at client. Client can get access to the Internet just by submitting the page through Browser, convenient and flexible, the disadvantage is that it is unable to provide powerful features, and its security is poor. C/S can play the advantages of hardware on each, designing friendly interface, providing powerful features. It has better security, but larger amount of client maintenance. The mode of combination is virtually based on the C/S. It is a mode which is developed in connection with client functional requirements and integrating the B/S. The schematic diagram of different patterns is as follow.
Figure 1. B/S mode

Figure 2. C/S mode
1.2. The Developing Language of Web Examination System

Actually, the developing language based on the web examination is a popular network programming language in present. They all have their own characteristics and applied areas. They are ASP, ASP.NET, PHP and JSP.

ASP fits for developing of medium and small sized site, whose advantage is to develop faster and cost lower, but its disadvantage is unqualified for the construction of large sites. It has high maintenance cost, slow speed and poor security. ASP.NET has general speed and security. It is a language of object-oriented which maintained easier. PHP has high speed and security, and can run in multi-platform operation. If a language is developed aiming at the object, its maintenance is relatively much easier. It is a developing language favored by many large sites. JSP runs faster and its security is extremely high. What's more, it is a multi-platform operation. But the speed of development is relatively slow, high cost, specifically in table 1:

<table>
<thead>
<tr>
<th>Development Language</th>
<th>Cost</th>
<th>Speed</th>
<th>Maintenance difficulty</th>
<th>Security</th>
<th>Portability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASP</td>
<td>Low</td>
<td>Low</td>
<td>Difficult</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>ASP.NET</td>
<td>General</td>
<td>General</td>
<td>Easy</td>
<td>General</td>
<td>Poor</td>
</tr>
<tr>
<td>PHP</td>
<td>Low</td>
<td>Fast</td>
<td>Easy</td>
<td>High</td>
<td>Good</td>
</tr>
<tr>
<td>JSP</td>
<td>High</td>
<td>Fast</td>
<td>Easy</td>
<td>High</td>
<td>Good</td>
</tr>
</tbody>
</table>

1.3. Background Database of Web Examination System

At present, ranging from Access to Oracle databases, are all widely applied in web examination system, different databases have their own significant features. Specific comparison is in table 2:

<table>
<thead>
<tr>
<th>Database</th>
<th>Performance</th>
<th>Compatibility</th>
<th>Operational</th>
<th>Development costs</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Poor</td>
<td>Poor</td>
<td>Simple</td>
<td>Low</td>
<td>Poor</td>
</tr>
<tr>
<td>SQL Server</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td>General</td>
</tr>
<tr>
<td>MySQL</td>
<td>General</td>
<td>General</td>
<td>General</td>
<td>Low</td>
<td>Good</td>
</tr>
<tr>
<td>Oracle</td>
<td>Good</td>
<td>Good</td>
<td>Complex</td>
<td>High</td>
<td>Good</td>
</tr>
</tbody>
</table>

The information shown on the table implies that, the large database has an obvious advantage on performance and compatibility. But its development cost is high. Although small database is not as good performance as large database, they are easy-operated and lower-cost, fit for small amount of data.

1.4. Web Server Platform of Web Examination System

The web server platform of web examination system mainly consists two categories -- Windows and Unix. We are familiar with Windows platform because of the wide usage and easy operation that accepted by the vast major users. However, Unix has its own unique advantages in the security and performance, specific in Table 3:

<table>
<thead>
<tr>
<th>Server Type</th>
<th>Performance</th>
<th>Security</th>
<th>Compatibility</th>
<th>Cost</th>
<th>Operability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>General</td>
<td>General</td>
<td>Good</td>
<td>High</td>
<td>Good</td>
</tr>
<tr>
<td>Unix</td>
<td>Good</td>
<td>Good</td>
<td>General</td>
<td>Low</td>
<td>General</td>
</tr>
</tbody>
</table>

1.5. The Data Storage way of Web Examination System in client

The processing on candidates' data in the current web examination system are divided into the following three categories: one-time upload after finished, upload in real time and real-time upload
combined with local preservation. One-time upload after finished are used mostly in low requirement of security environment. it has less difficulties in development and costs less. Real-time upload usually apply in B/S structure. Because of limitations of the model, local preservation is difficult to achieve, so we only can use real-time upload to improve the security. Local preservation combined with real-time upload applies much more in C/S model[3]. In terms of security, this is the ideal, specific in Table 4:

<table>
<thead>
<tr>
<th>Storage</th>
<th>Applicative Model</th>
<th>Security</th>
<th>Difficulty in Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-time</td>
<td>B/S and C/S</td>
<td>Poor</td>
<td>Simple</td>
</tr>
<tr>
<td>Real-time</td>
<td>B/S and C/S</td>
<td>General</td>
<td>General</td>
</tr>
<tr>
<td>Real-time Combined with Local</td>
<td>C/S</td>
<td>High</td>
<td>Difficult</td>
</tr>
</tbody>
</table>

2. The Achievement of Web Examination System in Colleges

2.1. The requirements of web examination system in colleges

Compared with other applications, college has its own characteristics: the large number of user, the diversity of examination content, the centralization of computers etc., which put forward the corresponding requirements to the system:

- huge concurrent data volume
  Colleges often have large computer rooms which can accommodate hundreds of people at the same time. During the examination, concurrent data volume is very impressive. We can solve this problem in two ways. First: if it based on B/S structure, we can resolve the problem by improving the network structure and the performance of network servers. Second: if it based on C/S structure, relatively speaking, the pressure on the network is significantly reduced, that we can increase the efficiency of generating the subject in the software design.

- abundant file formats which system supports
  The curriculum are rich in colleges, they often need to be carried out by means of other format except text, such as image files and animation files, the examination system should fully consider when designing.

- massive question bank
  Because of the large number of students and close communication in colleges, examination on computer can not be completed in one-time as normal examination. It can only be finished in batches, which requires the question bank must has a sufficient amount of topics, and keeps up to date, so as to result in reducing the disclosing of the project due to duplication, which will affect the fairness.

- uniform extraction
  Since the way of placing computer determined the difficulty of invigilating, and students can easily get help from closed classmate, so that the best solution is avoiding the adjacent machine presenting the same subjects. The current extractions are at random. It indeed has a significant effect which based on massive question bank. In order to achieve better effects, we can also disrupt the order of candidates. Even if the same subject are presented, there still be different answers.

2.2. the Realization of Universal Web Examination Platform in Our college

Through the studies above, the achievement of universal web examination system in our school is based on B/S three-tier model. Client machine works just through the IE browser, considering the development costs, server and easy to operate etc., we are using a development platform based on Windows 2003 + IIS6.0 and the development language is ASP.NET; background database is SQL Server Version 2000, the exam system diagram is as follows:
In order to solve the bottleneck problem of concurrent data, we adopt the combination with enhancing hardware performance, improving the network structure and optimizing the algorithm of generating subjects. For servers, when it is dealing with a large number of concurrent data, the memory volume plays a key around, so we can effectively improve the hardware performance by adding physical memory. Through the change from original 2G to 4G memory, compared to the time the page generated, the speed that the same amount of clients generate the same amount test questions is 7.6% increased. It is an obvious effect. In addition, optimization of network structure is also very important. The current computer room are basically based on network bandwidth 100M, more than enough for the application of the examination. We can improve network performance by replacing the high-performance switches, and minimize the client getting access to the server node[4].

Because of general using, we have to consider the support for different types of documents. For the file types that system can not recognize, such as AutoCAD, flash files, etc. we can use the feature of uploading and downloading attachments to a local client for viewing. Scoring function considers the way of integrating subjective questions with sub-human marking.

Building up test paper is a critical core of examination system, and its main differences on quality and speed is in selection and application of algorithms. At present, the popular algorithm is a genetic algorithm of better convergence, which consists of chromosome coding, individual fitness, genetic operation, crossover operator and the optimal preservation strategy [1]. In this system, we are using the optimized algorithm, that is, in the choice of the crossover probability, towards the shortcomings of traditional algorithm in the treatment of poor weak individual, which optimized for the following results:

$$m_{imp} = \exp\left(\frac{f_{Max} - f(x)}{f_{max}}\right) \times \frac{1}{1 + \frac{T}{T_{Gen}}} \times P_{m,Max}$$

$$P_{m}(t) = \begin{cases} m_{imp} & \text{if } m_{imp} > P_{m,Min} \\ P_{m,Min} & \text{else} \end{cases}$$

In the patterns, fMax is the maximum fitness in population; Pm, Max is the maximum pre-setted variation probability; Pm, Min is the minimum pre-set variation probability; f (x) is the fitness of individual to be an variation; Pm (t) is the variation probability of the individualx1 in the tth generation in population. This algorithm improves the searching speed and searching capacity, making it more conducive to search for the target solution [2], thereby it has achieved better effects in extracting.
Conclusion

This system aims at the popular examination system research at present, designing a set of common examinations for the college platform and providing a good condition for organizing all kinds of tests, and also have a great reference value for other colleges and universities.

References